Cisco 7500 Series Product Overview

The Cisco 7500 series includes the following routers: Cisco 7505, Cisco 7507, Cisco 7507-MX, Cisco 7513, Cisco 7513-MX, and Cisco 7576. The Cisco 7500 series routers support multiprotocol, multimedia routing and bridging with a wide variety of protocols and any combination of ATM, BRI, channel attachment, channelized E1, T1, and T3, Ethernet, Fast Ethernet, FDDI, HSSI, multichannel, PRI, Packet over SONET, synchronous serial, Token Ring, and voice media.

The first six sections of this chapter describe the Cisco 7500 series routers, and include the following:

Note The Cisco 7513, Cisco 7513-MX, and the Cisco 7576 are similar in appearance. To determine which router you have, look at the slot numbering label on the back of the unit. The Cisco 7513-MX and Cisco 7576 are identified as such on the slot numbering label.

The remaining sections of this chapter describe components in the Cisco 7500 series routers, which are considered to be standard equipment and ship with each router:

Terms and Acronyms

Following is a list of acronyms, initializations, and terms that identify the Cisco 7500 series system components and features:

- AIP—Asynchronous Transfer Mode (ATM) Interface Processor.
- Backplane—Single or dual system bus to which Cisco interface processors and system processors attach within a Cisco 7500 series router.
- Card cage—Assembly in which the backplane is mounted.
- CIP2—Channel Interface Processor.
- CT3IP—Channelized T3 Interface Processor.
- CxBus—Cisco Extended Bus, the 533-megabit-per-second (Mbps) data bus in the Cisco 7000 series routers.
- CyBus—Cisco Extended Bus, the 1.067-gigabit-per-second (Gbps) data bus in the Cisco 7500 series routers; the Cisco 7505 has one CyBus; the Cisco 7507, Cisco 7507-MX, Cisco 7513, and the Cisco 7513-MX have two CyBuses (called the *dual CyBus*) for an aggregate bandwidth of 2.134 Gbps. The Cisco 7576 has two dual CyBuses on a single split backplane creating two independent routers. Each Cisco 7576 independent router has an aggregate bandwidth of 2.134 Gbps. (Interface processors designed for the CxBus work with the CyBus.)
- dBus—Diagnostic bus for Route Switch Processor diagnostic and control access, system discovery and control, microcode download, and fault diagnosis for all processors connected to the CyBus.
- DIMM—Dual in-line memory module.
- DRAM—Dynamic random-access memory.
- EIP—Ethernet Interface Processor.
- FEIP—Fast Ethernet Interface Processor.
- FIP—FDDI Interface Processor.
- FSIP—Fast Serial Interface Processor.
- FRU—Field-replaceable unit, defined as any spare part that requires replacement by a Cisco-certified service provider.
- Gbps—Gigabits per second.
- HSA—High System Availability.
- HIP— HSSI Interface Processor.
- Interface processor—Printed circuit card attached to a metal carrier that provides the electrical interfaces used by the Cisco 7500 series routers.
- Mbps—Megabits per second.
- MIP—MultiChannel Interface Processor.
- NVRAM—Nonvolatile random-access memory.
- POSIP—Packet over OC-3 Interface Processor.
- Processor modules—All interface processors and main system processors used in the Cisco 7500 series routers.
- RSP—Route Switch Processor; the main system processor. In this publication, the term *RSP* includes all RSP models (differences between RSP models are clearly noted).
- RSP2—Specific main system RSP for the Cisco 7505.

- RSP4/4+—Specific main system RSP for the Cisco 7507, Cisco 7513, and Cisco 7576.
- RSP8—Specific main system RSP for the Cisco 7507-MX and Cisco 7513-MX.
- RSP16—Specific main system RSP for the Cisco 7507, Cisco 7507-MX, and Cisco 7513 and Cisco 7513-MX.
- SIMM—Single in-line memory module.
- Spares—Spare parts that do not require replacement by a Cisco-certified service provider.
- SRAM—Static random-access memory.
- TDM bus—Connectors on the backplane of the Cisco 7507-MX, Cisco 7513-MX, and Cisco 7576 that are designed for future time-division multiplexing hardware as it becomes available.
- TRIP—Token Ring Interface Processor.
- VIP2—Second-Generation Versatile Interface Processor: incorporates interchangeable port and service adapters for flexible interface functionalities.
- VIP4/4+—Fourth-Generation Versatile Interface Processor: incorporates the same features as the VIP2, but with higher distributed switching, increased bandwidth, and features such as high availability and high service availability, which further reduces system downtime.
- VIP6-80—The VIP6-80 improves performance over previous versatile interface processors.

Cisco 7505 Overview

The Cisco 7505 supports multiprotocol, multimedia routing and bridging with a wide variety of protocols and any combination of available electrical interfaces and media. Network interfaces reside on interface processors that provide a direct connection between the CyBus in your Cisco 7505 and external networks.

The Cisco 7505 has five slots: four interface processor slots (0 through 3) and one slot for the Route Switch Processor (RSP2, RSP4/4+, or RSP8). The Cisco 7505 supports 4 VIPs, one for each interface processor slot. The Cisco 7505 uses a single power supply, with two models available: DC input or AC input.

The front, or noninterface processor end, of the Cisco 7505 has a removable panel that is secured with two captive fasteners. See Figure 1-1. Removing the panel provides access to the internal components: the power supply and fan tray.

Figure 1-1 Cisco 7505 (Front View)

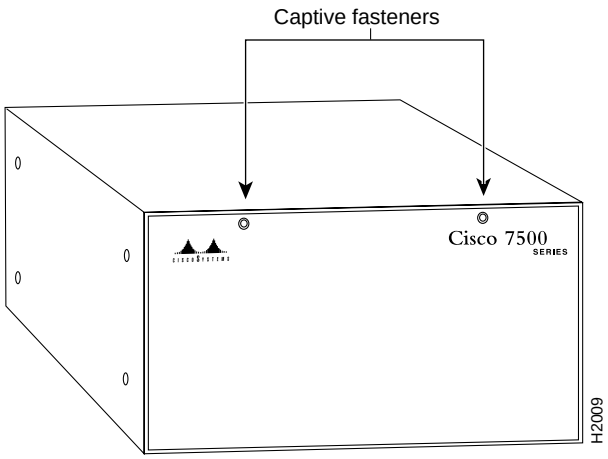
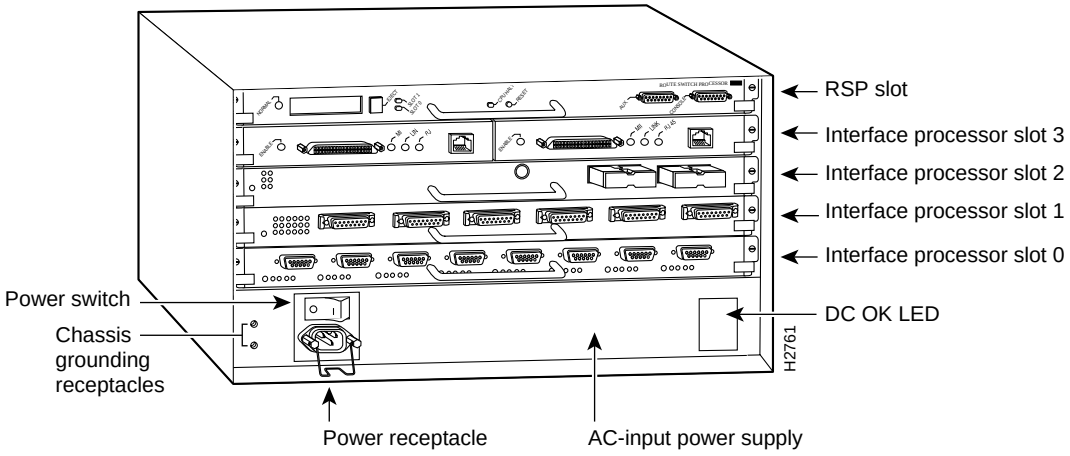


Figure 1-2 shows details of the rear, interface-processor end of the Cisco 7505.

Figure 1-2 Cisco 7505 (Rear View)

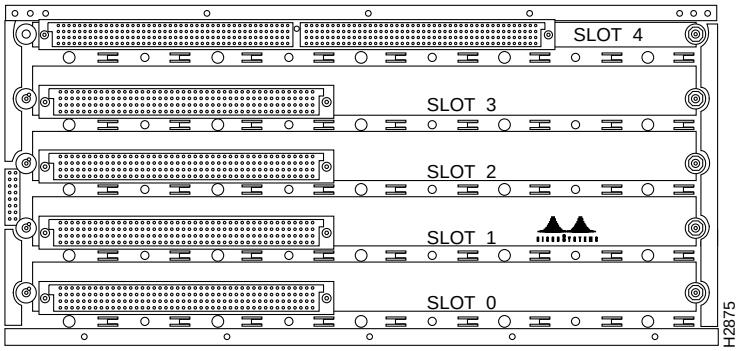


Cisco 7505 CyBus Backplane

The CyBus backplane in the Cisco 7505 provides the physical connections for the RSPs and interface processors, and transfers information at up to 1.067 Gbps.

The Cisco 7505 CyBus backplane has five slots: interface processor slots 0 through 3, and one slot for the RSP (RSP2, RSP4/4+, or RSP8), as shown in Figure 1-3.

Figure 1-3 CyBus Backplane in the Cisco 7505



The backplane slots are keyed so that the processor modules can be installed only in the slots designated for them. Keys on the backplane fit into two key guides on each module. Although the RSP uses unique keys, all four interface processor slots use the same key, so you can install an interface processor in any interface processor slot, but not in the RSP slot.

Caution When installing an RSP, ensure that you are installing it in the appropriate slot to avoid damaging the key guides or the backplane.

Cisco 7505 System Specifications

Table 1-1 lists the specifications for the Cisco 7505 system.

Table 1-1 Cisco 7505 Specifications

Description	Specification
High-speed backplane	1.067 Gbps CyBus, 4 interface processor slots, and 1 RSP slot
Dimensions (H x W x D)	10.5 x 17.5 x 17.0 in. (26.67 x 44.45 x 43.18 cm) Chassis depth including power cord and cable management brackets is 19 in. (48.26 cm)
Weight	Chassis only (including power supply and fan array): 46 lb (20.87 kg) Chassis fully configured with 1 RSP and 4 interface processors: 70 lb (31.75 kg)
Power dissipation	600W maximum configuration with AC-input power supply 600W maximum configuration with DC-input power supply
Heat dissipation	715W (2440 Btu/hr)
Power distribution	75A maximum @ +5 VDC, 15A maximum @ +12 VDC, 3A maximum @ –12 VDC, 5A maximum @ +24 VDC
AC-input rating	100 to 240 VAC, wide input with power factor corrector (PFC); 9A maximum @ 100 VAC, 4A maximum @ 240 VAC (at 600W)
AC-input cable	12 AWG, with 3 leads, an IEC-320 plug on the router end, and a country-dependent plug on the power source end
Frequency	50 to 60 Hz

Table 1-1 Cisco 7505 Specifications (continued)

Description	Specification
DC-input rating	–40 VDC minimum in North America (–56 VDC in European Union) –48 VDC nominal in North America (–60 VDC in European Union) –52 VDC maximum in North America (–72 VDC in European Union) 20A maximum at –48 VDC and 16A maximum @ –60 VDC
DC-input cable	10 AWG, recommended minimum wire gauge (you provide the wire)
DC-input hold-up time	10 ms of output after the DC input has been interrupted
Airflow	Side-to-side through the chassis using a variable-speed, 6-fan array
Temperature	32 to 104 F (0 to 40 C), operating; –4 to 149 F (–20 to 65 C), nonoperating
Humidity	10 to 90%, noncondensing
Software requirement	RSP2 – Cisco IOS Release 10.3(6) or a later release of 10.3 RSP4/4+ – Cisco IOS Release 11.1(8)CA or a later release of 11.1 RSP8 – Cisco IOS Release 12.0(9)S or a later release of 12.0 S
Agency approvals	Safety: UL 1950, CSA 22.2-No. 950, EN60950, EN41003, AUSTEL TS001, AS/NZS 3260, IEC 801-2, 3, 4, 5, and 6 EMI: FCC Class A, VCCI Class II, and CISPR 22 B (EN 55022) Conducted Emissions

Cisco 7507 Overview

The Cisco 7507 supports multiprotocol, multimedia routing and bridging with a wide variety of protocols and any combination of available electrical interfaces and media.

Network interfaces reside on interface processors that provide a direct connection between the two CyBuses in the Cisco 7507 and your external networks. The Cisco 7507 has seven slots: interface processor slots 0 and 1, Route Switch Processor (RSP2, RSP4/4+, RSP8, or RSP16) slots 2 and 3, and interface processor slots 4 through 6. The Cisco 7507 supports 5 VIPs, one for each interface processor slot.

There are bays for up to two AC-input or DC-input power supplies. The chassis will operate with one power supply. Although a second power supply is not required, it allows load sharing and increased system availability.

Caution Because of agency compliance and safety issues, mixing AC-input and DC-input power supplies in the same Cisco 7507 is not a supported configuration and should not be attempted. Doing so might cause damage.

The Cisco 7507 front panel, shown in Figure 1-4, contains three status indicators and two removable panels for access to the internal components. The three light emitting diodes (LEDs) on the front panel indicate normal system operation and the currently active power supplies. On the back of the router, a normal LED on the RSP and LEDs on the power supplies indicate the same status.

Figure 1-4 Cisco 7507 (Front View)

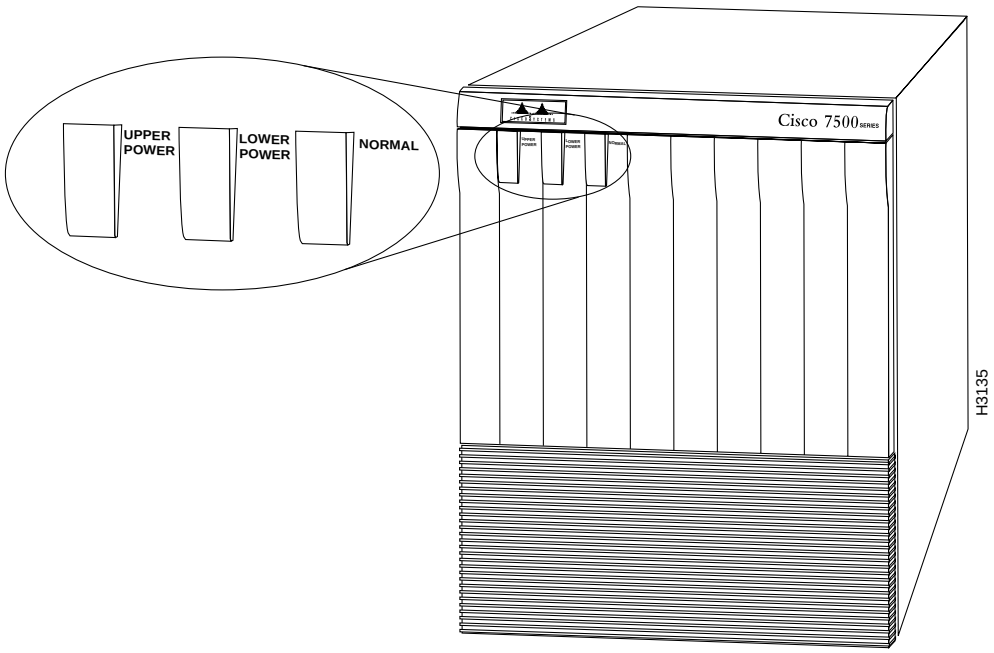
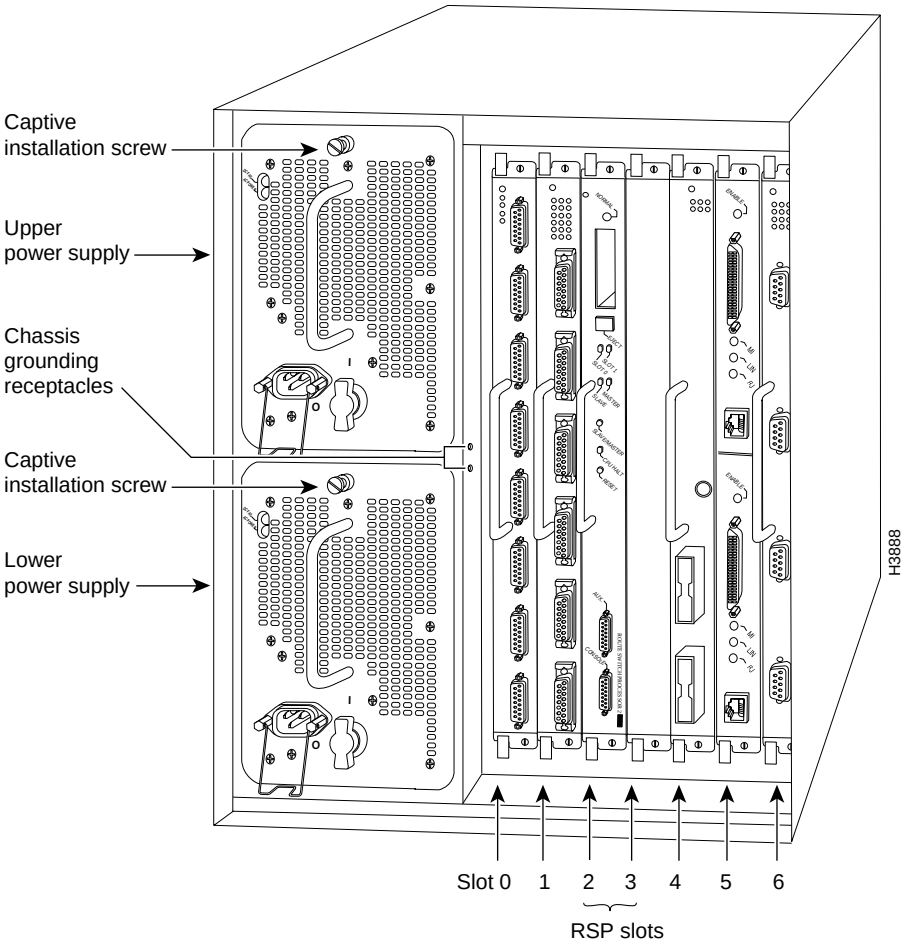


Figure 1-5 shows details on the rear, interface-processor end of the Cisco 7507.

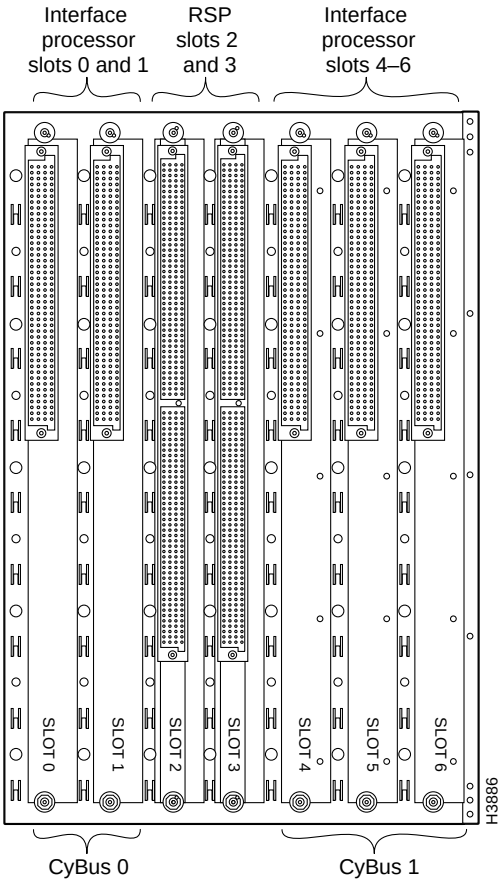
Figure 1-5 Cisco 7507 (Rear View)



Cisco 7507 Dual CyBus Backplane

The dual CyBus backplane provides the physical connections for the RSPs and interface processors, and transfers information at up to 2.134 Gbps (1.067 Gbps per CyBus). The dual CyBus has seven slots: interface processor slots 0 and 1 (CyBus 0), RSP slots 2 and 3, and interface processor slots 4 through 6 (CyBus 1), as shown in Figure 1-6.

Figure 1-6 Dual CyBus Backplane in the Cisco 7507



An RSP2, RSP4/4+, RSP8, or RSP 16 in either slot 2 or slot 3 controls both CyBus 0 and CyBus 1. The dual CyBus backplane in the Cisco 7507 has an aggregate bandwidth of 2.134 Gbps. The two CyBuses are independent of one another. Interface processors connected to one CyBus are unaffected by the traffic generated by the interface processors connected to the other.

The backplane slots are keyed so that the processor modules can be installed only in the slots designated for them. Keys on the backplane fit into two key guides on each module. Although the RSP uses unique keys, all five interface processor slots use the same key, so you can install an interface processor in any interface processor slot, but not in the RSP slot.

Cisco 7507 System Specifications

Table 1-2 lists the specifications for the Cisco 7507 system.

Table 1-2 Cisco 7507 Specifications

Description	Specification
High-speed backplane	Two 1.0677-Gbps CyBuses, 5 interface processor slots, 2 RSP slots
Dimensions (H x W x D)	19.25 x 17.5 x 25.1 in. (48.90 x 44.45 x 63.75 cm) Chassis depth including power cord is 28 in. (71.12 cm)
Weight	Chassis only: 76 lb (34.47 kg) Chassis fully configured, using all slots and 2 power supplies: 145 lb (65.76 kg)
Power supply	700W maximum (for AC-input and DC-input power supplies)
Power dissipation	626W maximum configuration 530W typical with maximum configuration
Heat dissipation	1200W (4100 Btu/hr) with AC-input 300W (1024 Btu/hr) with DC-input
AC-input voltage	100 to 240 VAC, wide input with power factor corrector (PFC)
AC-input cable	12 AWG, with 3 leads, an IEC-320 plug on the router end, and a country-dependent plug on the power source end
Frequency	50 to 60 Hz autoranging
AC-input ratings	10A maximum @ 100 VAC, 6A maximum @ 240 VAC, chassis fully configured
DC-input ratings	–40 VDC minimum, –48 VDC nominal, –72 VDC maximum
Power distribution	+5.2 VDC @ 95A, +12 VDC @ 15A, –12 VDC @ 5A, +24 VDC @ 4A
DC-input cable	8 AWG, recommended minimum wire gauge (you provide thewire)
Airflow	140 cfm through the system blower
Operating temperature	32 to 104 F (0 to 40 C)
Nonoperating temperature	–4 to 149 F (–20 to 65 C)
Humidity	10 to 90%, noncondensing
Software requirement	RSP2 – Cisco IOS Release 10.3(6) or a later release of 10.3 RSP4/4+ – Cisco IOS Release 11.1(8)CA or a later release of 11.1 RSP8 – Cisco IOS Release 12.0(9)S or a later release of 12.0 S RSP16 – Cisco IOS Release 12.1(12)E and later and Cisco IOS 12.0(21.02)S and later
Agency approvals	Safety: UL 1950, CSA 22.2-950, EN60950: 1992 EMI: FCC Class A, EN55022 Class B, VCCI Class 2

Cisco 7507-MX Overview

The Cisco 7507-MX supports multiprotocol, multimedia routing and bridging with a wide variety of protocols and any combination of available electrical interfaces and media.

Network interfaces reside on interface processors that provide a direct connection between the two CyBuses in the Cisco 7507-MX and your external networks. The Cisco 7507-MX has seven slots: interface processor slots 0 and 1, Route Switch Processor (RSP2, RSP4/4+, RSP8, or RSP16) slots 2 and 3, and interface processor slots 4 through 6. The Cisco 7507-MX supports 5 VIPs, one for each interface processor slot.

There are bays for up to two AC-input or DC-input power supplies. The chassis will operate with one power supply. Although a second power supply is not required, it allows load sharing and increased system availability.

Caution Because of agency compliance and safety issues, mixing AC-input and DC-input power supplies in the same Cisco 7507-MX is not a supported configuration and should not be attempted. Doing so might cause damage.

The Cisco 7507-MX front panel, shown in Figure 1-7, contains three status indicators and two removable panels for access to the internal components. The three light emitting diodes (LEDs) on the front panel indicate normal system operation and the currently active power supplies. On the back of the router, a normal LED on the RSP and LEDs on the power supplies indicate the same status.

Figure 1-7 Cisco 7507-MX (Front View)

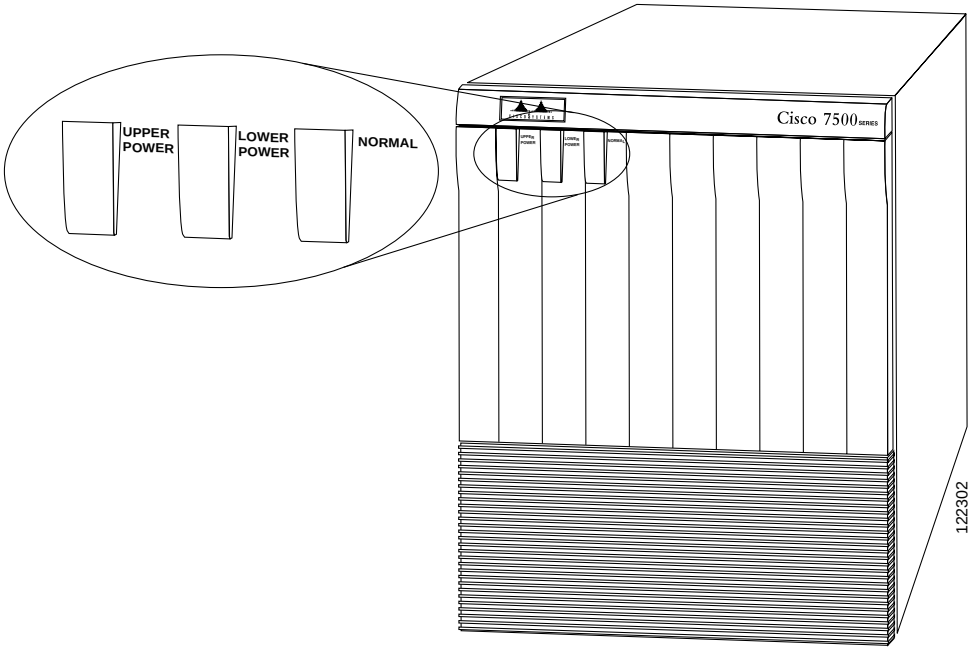
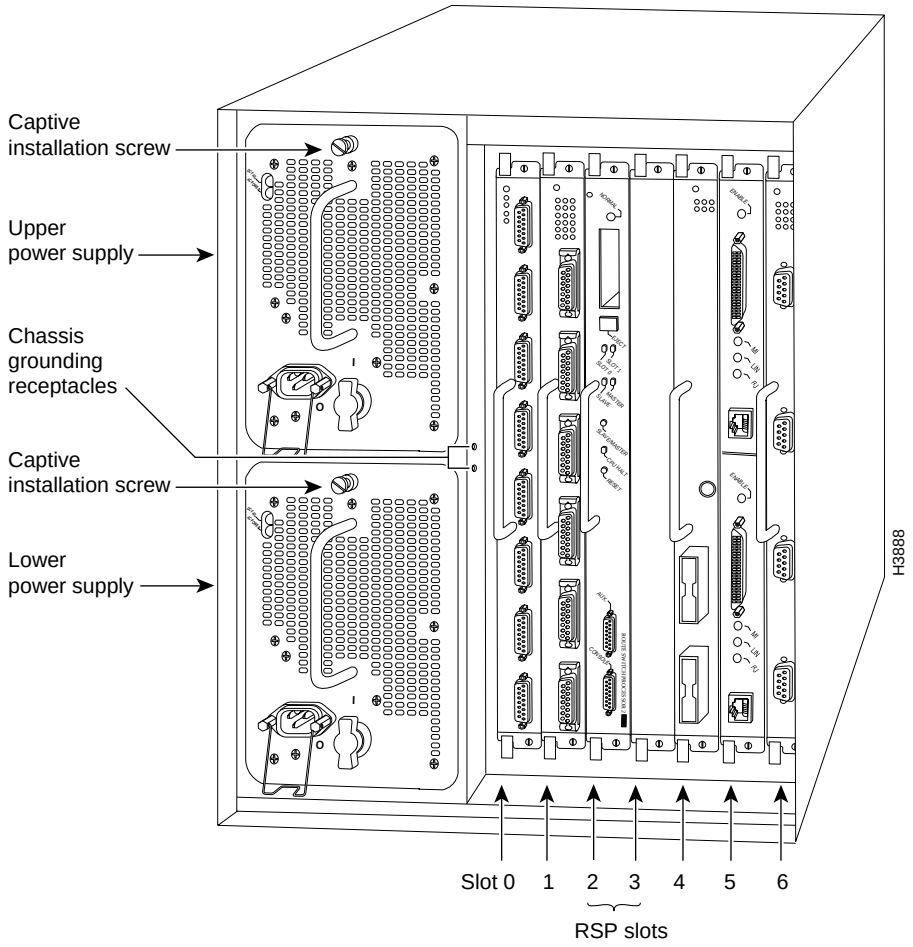


Figure 1-8 shows details on the rear, interface-processor end of the Cisco 7507-MX.

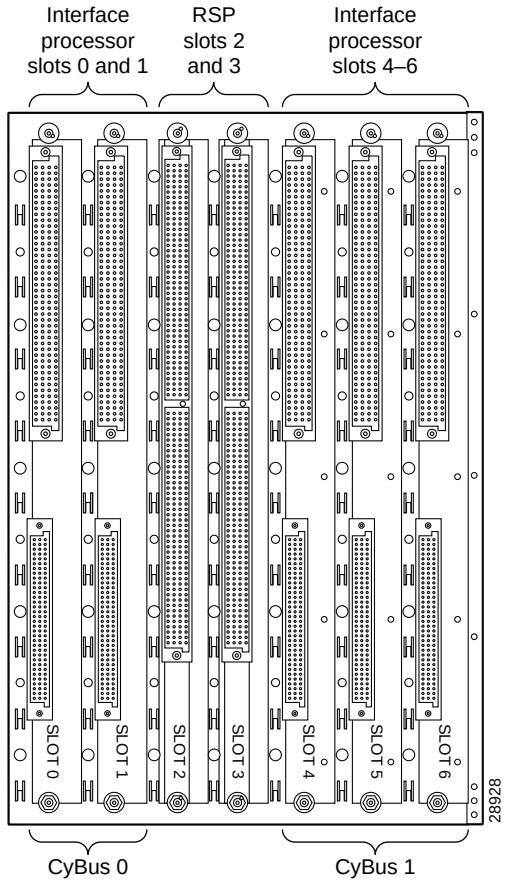
Figure 1-8 Cisco 7507-MX (Rear View)



Cisco 7507-MX Dual CyBus Backplane

The dual CyBus backplane provides the physical connections for the RSPs and interface processors, and transfers information at up to 2.134 Gbps (1.067 Gbps per CyBus). The dual CyBus has seven slots: interface processor slots 0 and 1 (CyBus 0), RSP slots 2 and 3, and interface processor slots 4 through 6 (CyBus 1), as shown in Figure 1-9.

Figure 1-9 Dual CyBus Backplane in the Cisco 7507-MX



Note The Cisco 7507-MX backplane includes connectors for time-division multiplexing (TDM)-compatible hardware. These connectors allow you to connect the Cisco 7507-MX to future TDM hardware as it becomes available. The Cisco 7507-MX also includes Cisco's turbo arbiter. The turbo arbiter, when used in conjunction with other future hardware, significantly increases system bandwidth. When not used with this future hardware, the turbo arbiter operates in standard CyBus mode.

An RSP2, RSP4/4+, or RSP8 in either slot 2 or slot 3 controls both CyBus 0 and CyBus 1. The dual CyBus backplane in the Cisco 7507-MX has an aggregate bandwidth of 2.134 Gbps. The two CyBuses are independent of one another. Interface processors connected to one CyBus are unaffected by the traffic generated by the interface processors connected to the other.

The backplane slots are keyed so that the processor modules can be installed only in the slots designated for them. Keys on the backplane fit into two key guides on each module. Although the RSP uses unique keys, all five interface processor slots use the same key, so you can install an interface processor in any interface processor slot, but not in the RSP slot.

Cisco 7507-MX System Specifications

Table 1-3 lists the specifications for the Cisco 7507-MX system.

Table 1-3 Cisco 7507-MX Specifications

Description	Specification
High-speed backplane	Two 1.0677-Gbps CyBuses, 5 interface processor slots, 2 RSP slots
Dimensions (H x W x D)	19.25 x 17.5 x 25.1 in. (48.90 x 44.45 x 63.75 cm) Chassis depth including power cord is 28 in. (71.12 cm)
Weight	Chassis only: 76 lb (34.47 kg) Chassis fully configured, using all slots and 2 power supplies: 145 lb (65.76 kg)
Power supply	700W maximum (for AC-input and DC-input power supplies)
Power dissipation	626W maximum configuration 530W typical with maximum configuration
Heat dissipation	1200W (4100 Btu/hr) with AC-input 300W (1024 Btu/hr) with DC-input
AC-input voltage	100 to 240 VAC, wide input with power factor corrector (PFC)
AC-input cable	12 AWG, with 3 leads, an IEC-320 plug on the router end, and a country-dependent plug on the power source end
Frequency	50 to 60 Hz autoranging
AC-input ratings	10A maximum @ 100 VAC, 6A maximum @ 240 VAC, chassis fully configured
DC-input ratings	–40 VDC minimum, –48 VDC nominal, –72 VDC maximum
Power distribution	+5.2 VDC @ 95A, +12 VDC @ 15A, –12 VDC @ 5A, +24 VDC @ 4A
DC-input cable	8 AWG, recommended minimum wire gauge (you provide the wire)
Airflow	140 cfm through the system blower
Operating temperature	32 to 104 F (0 to 40 C)
Nonoperating temperature	–4 to 149 F (–20 to 65 C)
Humidity	10 to 90%, noncondensing
Software requirement	RSP2 – Cisco IOS Release 10.3(6) or a later release of 10.3 RSP4/4+ – Cisco IOS Release 11.1(8)CA or a later release of 11.1 RSP8 – Cisco IOS Release 12.0(9)S or a later release of 12.0 S RSP16 – Cisco IOS Release 12.1(12)E and later and Cisco IOS 12.0(21.02)S and later
Agency approvals	Safety: UL 1950, CSA 22.2-950, EN60950: 1992 EMI: FCC Class A, EN55022 Class B, VCCI Class 2

Cisco 7513 Overview

The Cisco 7513 router supports multiprotocol, multimedia routing and bridging with a wide variety of protocols and any combination of available electrical interfaces and media. Network interfaces reside on interface processors that provide a direct connection between the two CyBuses in the Cisco 7513 and your external networks. The Cisco 7513 has 13 slots: interface processor slots 0 through 5, Route Switch Processor (RSP2, RSP4/4+, RSP8, or RSP16) slots 6 and 7, and interface processor slots 8 through 12. The Cisco 7513 supports 11 VIPs, one for each interface processor slot.

There are bays for up to two AC-input or DC-input power supplies. The chassis will operate with one power supply. Although a second power supply is not required, it allows load sharing and increased system availability.

Caution Because of agency compliance and safety issues, mixing AC-input and DC-input power supplies in the same Cisco 7513 is not a supported configuration and should not be attempted. Doing so might cause damage.

The Cisco 7513 is shown in Figure 1-10. The three front-panel LEDs indicate system and power supply status, and LEDs on the RSP, interface processors, and power supplies indicate status.

Figure 1-10 Cisco 7513 (Front View)

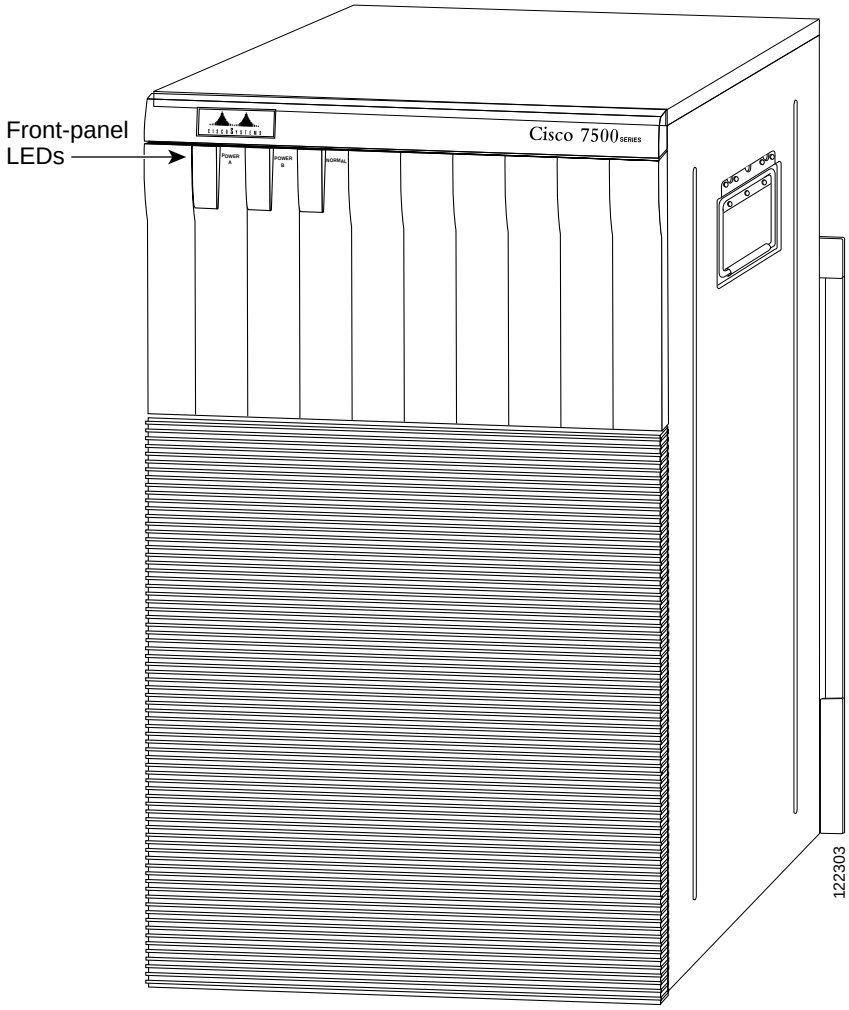
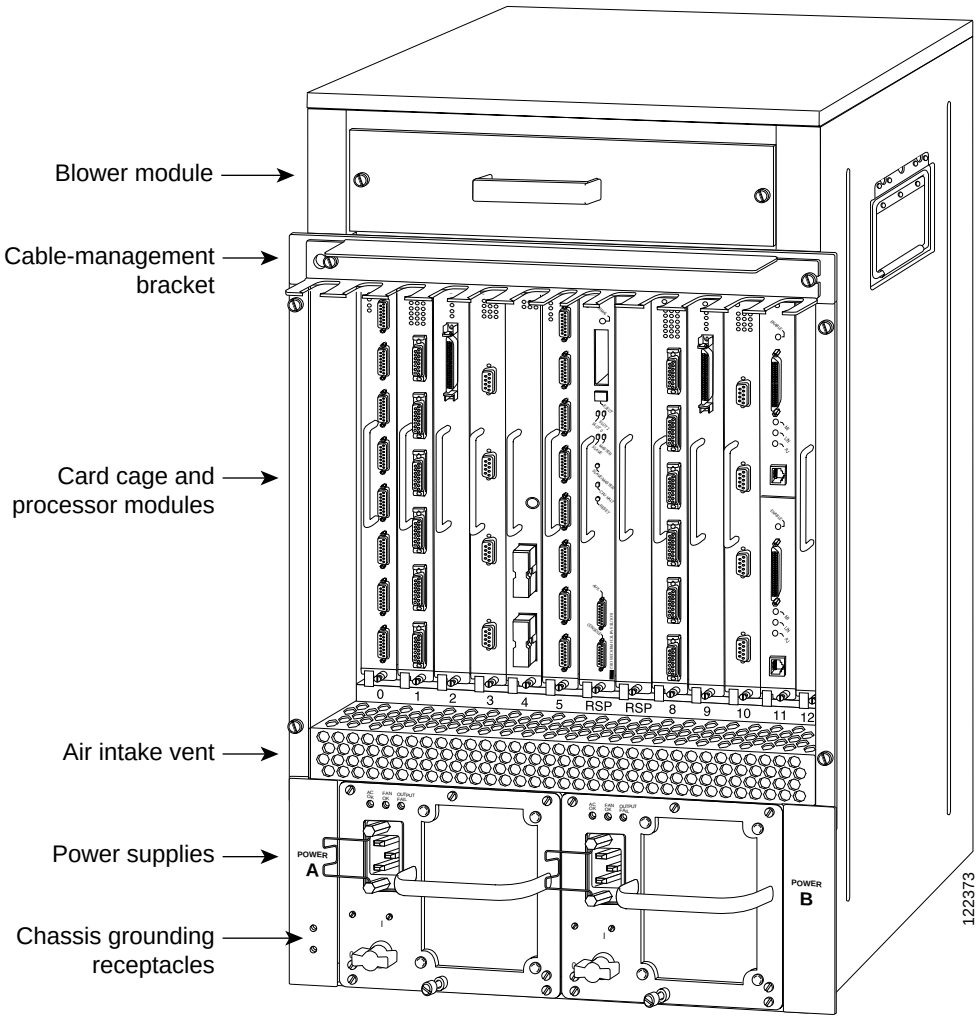


Figure 1-11 shows details on the rear, interface-processor end of the Cisco 7513.

Figure 1-11 Cisco 7513 (Rear View)

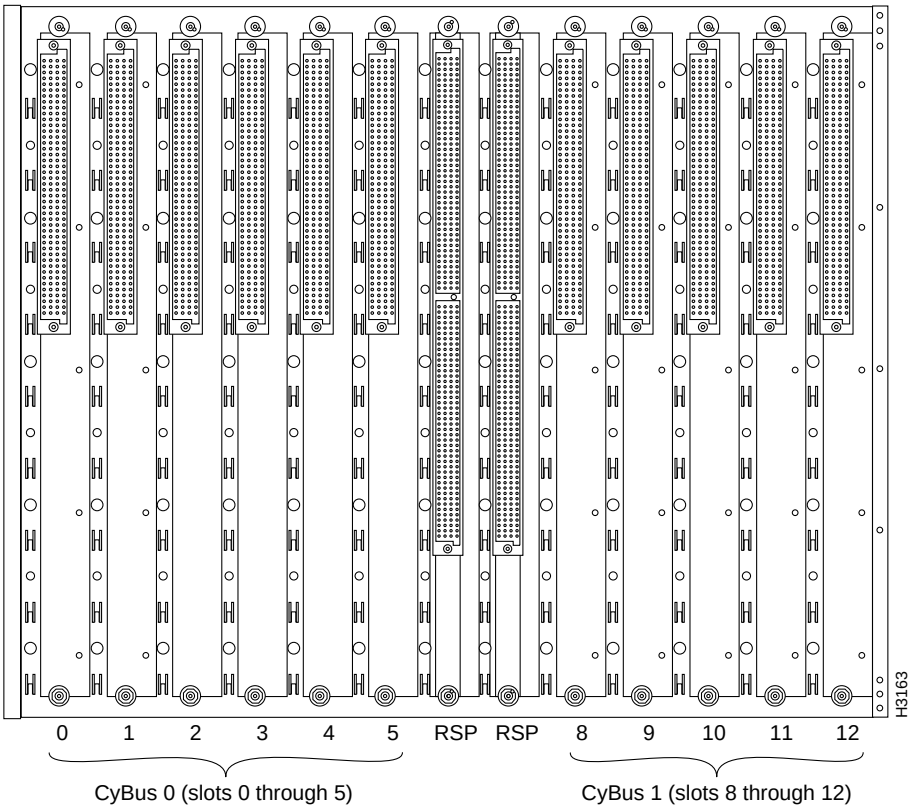


Cisco 7513 Dual CyBus Backplane

The dual CyBus backplane, located at the rear of the Cisco 7513 removable card cage, provides the physical connections for the RSPs and interface processors, and transfers information at up to 2.134 Gbps (1.067 Gbps per CyBus).

The dual CyBus has 13 slots: interface processor slots 0 through 5 (CyBus 0); two RSP slots (slots 6 and 7); interface processor slots 8 through 12 (CyBus 1), as shown in Figure 1-12.

Figure 1-12 Dual CyBus Backplane in the Cisco 7513



An RSP2, RSP4/4+, or RSP8 in either slot 6 or slot 7 controls both CyBus 0 and CyBus 1. The dual CyBus backplane in the Cisco 7513 has an aggregate bandwidth of 2.134 Gbps. Interface processors connected to one CyBus are unaffected by the traffic generated by the interface processors connected to the other CyBus. The two CyBuses are independent of one another.

The backplane slots are keyed so that the processor modules can be installed only in the slots designated for them. Keys on the backplane fit into two key guides on each module. Although the RSP uses unique keys, all eleven interface processor slots use the same key, so you can install an interface processor in any interface processor slot, but not in the RSP slot.

Note A spare card cage assembly ships as Product Number MAS-7513CDCAGE=. For maintenance information about the card cage assembly, see the "Removing and Replacing the Cisco 7513, Cisco 7513-MX, and Cisco 7576 Card Cage Assembly" section on page 7-5.

Cisco 7513 System Specifications

Table 1-4 lists the specifications for the Cisco 7513 system.

Table 1-4 Cisco 7513 Specifications

Backplane	Two 1.0677-Gbps CyBuses, 11 interface processor slots, 2 RSP slots
Dimensions (H x W x D)	33.75 x 17.5 x 22 in. (85.73 x 44.45 x 55.88 cm) Chassis width including rack-mount flanges is 18.93 in. (48.1 cm) Chassis depth including power cables and cable-management bracket: 24 in. (60.96 cm)
Weight	Chassis with blower module: 75 lb (34.02 kg) Chassis with blower module and 1 power supply: 100 lb (45.36 kg) Chassis with blower module and 2 power supplies: 125 lb (56.7 kg) Chassis with blower module, 2 power supplies, and all slots filled: ~160 lb (72.58 kg), each processor module weighs ~2.5 lb (1.13 kg)
Power dissipation	1600W with a maximum configuration and 1 AC-input power supply 1600W with a maximum configuration and 1 DC-input power supply 1700W nominal with a maximum configuration and either 2 AC-input or 2 DC-input power supplies
Heat dissipation	1600W (5461 Btu/hr)
AC-input voltage	100 to 240 VAC
Frequency	50/60 Hz
AC-input cable[1]	12 AWG, with 3 leads, an IEC-320 plug on the router end, and a country-dependent plug on the power source end
AC-input voltage and current	100 VAC at 16 amps (A) maximum, wide input with power factor corrector (PFC) 240 VAC at 7A maximum
DC-input voltage and current	–48 VDC nominal at 35A in North America (–60 VDC at 35A in the European Union)
DC-input cable	8 AWG (recommended minimum), with 3 leads and rated for at least 194 F(90 C)(you supply the cable)
Power distribution	+5.2 VDC @ 75A, +12 VDC @ 15A, –12 VDC @ 3A, +24 VDC @ 5A
Airflow/noise level	Bottom to top through chassis by variable-speed blower (62 to 70 dBA)
Temperature	32 to 104 F (0 to 40 C), operating; –4 to 149 F (–20 to 65 C), nonoperating
Relative humidity	10 to 90%, noncondensing
Software requirement	RSP2 – Cisco IOS Release 10.3(6) or a later release of 10.3 RSP4/4+ – Cisco IOS Release 11.1(8)CA or a later release of 11.1 RSP8 – Cisco IOS Release 12.0(9)S or a later release of 12.0 S RSP16 – Cisco IOS Release 12.1(12)E and later and Cisco IOS 12.0(21.02)S and later
Agency approvals	Safety: UL 1950, CSA 22.2-950, EN60950, EN41003, TS001, AS/NZS 3260 EMI: FCC Class A, EN60555-2, EN55022 Class B, VDE 0878 Part 3, 30 Class B Immunity: EN55101/2 (ESD), EN55101/3 (RFI), EN55101/4 (Burst), EN55101/5 (Surge), EN55101/6 (Conducted), IEC77B (AC Disturbance)

1. The Cisco 7513 requires a minimum of 20A service with a 20A receptacle at the power source. The power cable supplied with the Cisco 7513 uses a 20A male plug.

Cisco 7513-MX Overview

The Cisco 7513-MX router supports multiprotocol, multimedia routing and bridging with a wide variety of protocols and any combination of available electrical interfaces and media. Network interfaces reside on interface processors that provide a direct connection between the two CyBuses in the Cisco 7513-MX and your external networks. The Cisco 7513-MX has 13 slots: interface processor slots 0 through 5, Route Switch Processor (RSP2, RSP4/4+, RSP8, or RSP16) slots 6 and 7, and interface processor slots 8 through 12. The Cisco 7513-MX supports 11 VIPs, one for each interface processor slot.

There are bays for up to two AC-input or DC-input power supplies. The chassis will operate with one power supply. Although a second power supply is not required, it allows load sharing and increased system availability.

Caution Because of agency compliance and safety issues, mixing AC-input and DC-input power supplies in the same Cisco 7513-MX is not a supported configuration and should not be attempted. Doing so might cause damage.

The Cisco 7513-MX is shown in Figure 1-13. The three front-panel LEDs indicate system and power supply status, and LEDs on the RSP, interface processors, and power supplies indicate status.

Figure 1-13 Cisco 7513-MX (Front View)

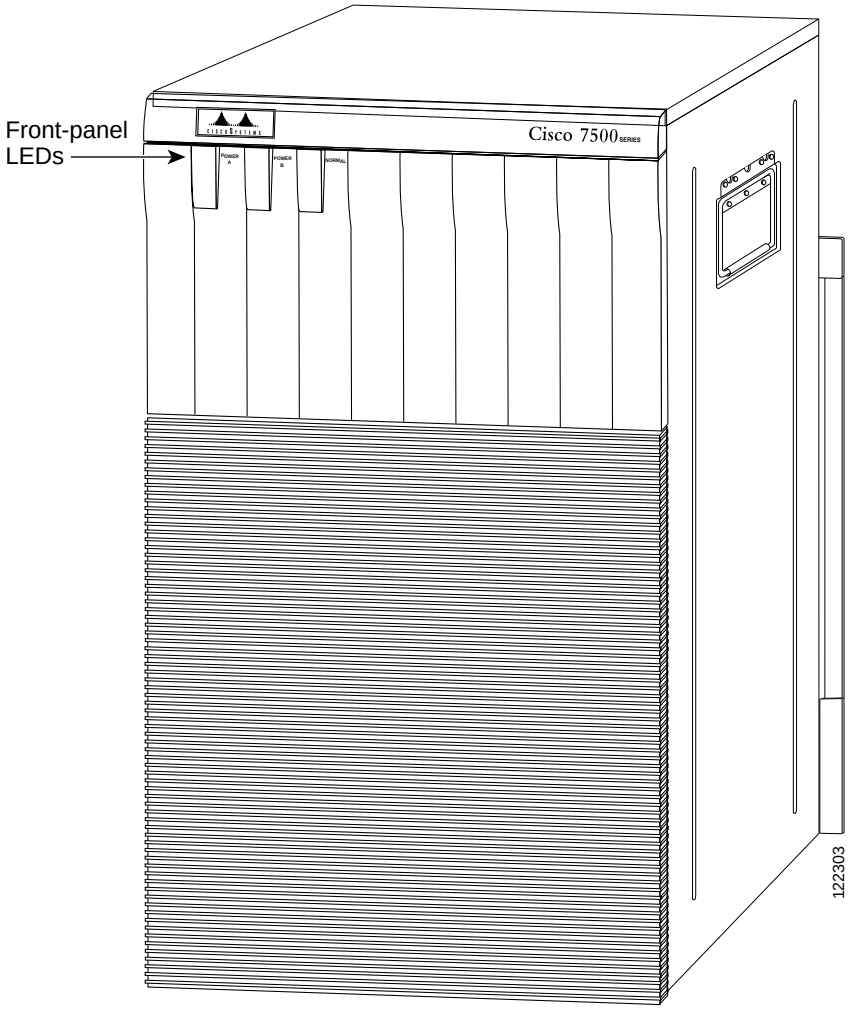
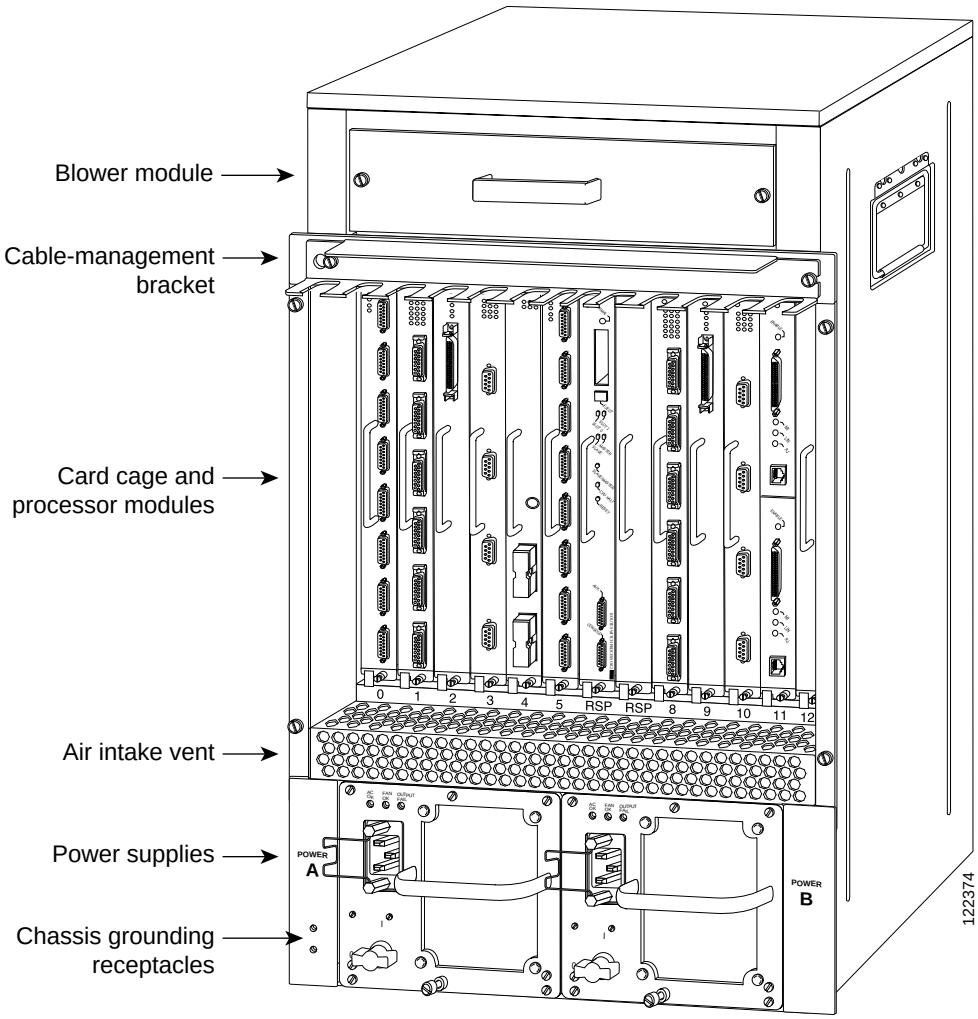


Figure 1-14 shows details on the rear, interface-processor end of the Cisco 7513-MX.

Figure 1-14 Cisco 7513-MX (Rear View)

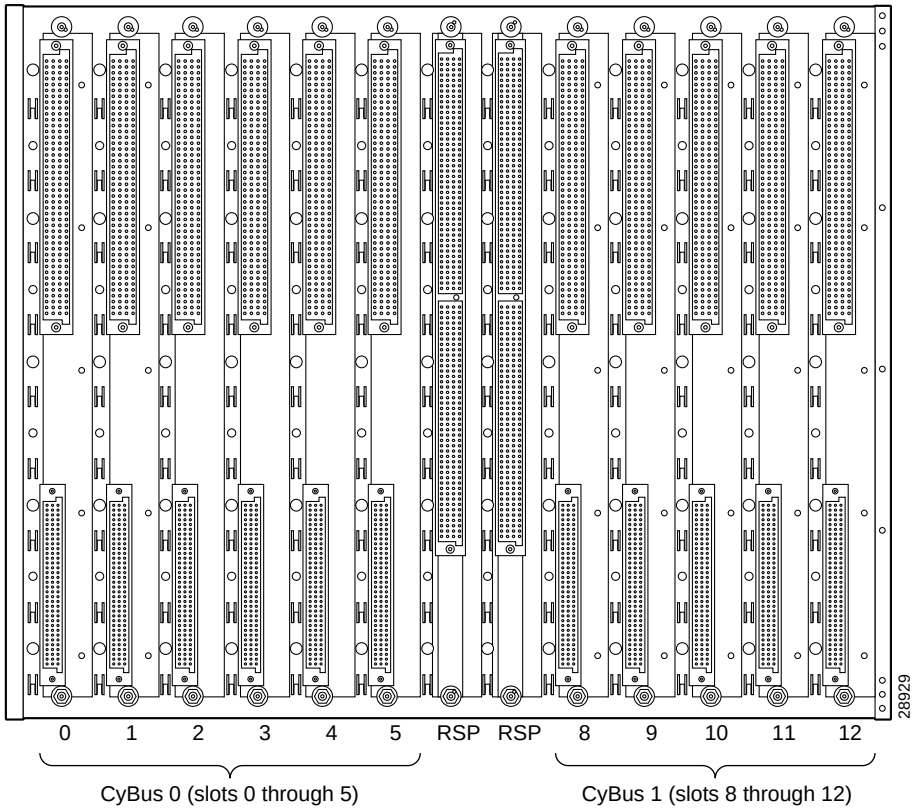


Cisco 7513-MX Dual CyBus Backplane

The dual CyBus backplane, located at the rear of the Cisco 7513-MX removable card cage, provides the physical connections for the RSPs and interface processors, and transfers information at up to 2.134 Gbps (1.067 Gbps per CyBus).

The dual CyBus has 13 slots: interface processor slots 0 through 5 (CyBus 0); two RSP slots (slots 6 and 7); interface processor slots 8 through 12 (CyBus 1), as shown in Figure 1-15.

Figure 1-15 Dual CyBus Backplane in the Cisco 7513-MX



Note The Cisco 7513-MX backplane includes connectors for time-division multiplexing (TDM)-compatible hardware. These connectors allow you to connect the Cisco 7513-MX to future TDM hardware as it becomes available. The Cisco 7513-MX also includes the Cisco turbo arbiter. The turbo arbiter, when used in conjunction with other future hardware, significantly increases system bandwidth. When not used with this future hardware, the turbo arbiter operates in standard CyBus mode.

An RSP2, RSP4/4+, or RSP8 in either slot 6 or slot 7 controls both CyBus 0 and CyBus 1. The dual CyBus backplane in the Cisco 7513-MX has an aggregate bandwidth of 2.134 Gbps. Interface processors connected to one CyBus are unaffected by the traffic generated by the interface processors connected to the other CyBus. The two CyBuses are independent of one another.

The backplane slots are keyed so that the processor modules can be installed only in the slots designated for them. Keys on the backplane fit into two key guides on each module. Although the RSP uses unique keys, all eleven interface processor slots use the same key, so you can install an interface processor in any interface processor slot, but not in the RSP slot.

Note A spare card cage assembly ships as Product Number MAS-7513MX-CDCAGE=. For maintenance information about the card cage assembly, see the "Removing and Replacing the Cisco 7513, Cisco 7513-MX, and Cisco 7576 Card Cage Assembly" section on page 7-5.

Cisco 7513-MX System Specifications

Table 1-5 lists the specifications for the Cisco 7513-MX system.

Table 1-5 Cisco 7513-MX Specifications

Description	Specification
Backplane	Two 1.0677-Gbps CyBuses: 11 interface processor slots, 2 RSP slots
Dimensions (H x W x D)	33.75 x 17.5 x 22 in. (85.73 x 44.45 x 55.88 cm) Chassis width including rack-mount flanges is 18.93 in. (48.1 cm) Chassis depth including power cables and cable-management bracket is 24 in. (60.96 cm)
Weight	Chassis with blower module: 75 lb (34.02 kg) Chassis with blower module and 1 power supply: 100 lb (45.36 kg) Chassis with blower module and 2 power supplies: 125 lb (56.7 kg) Chassis with blower module, 2 power supplies, and all slots filled: ~160 lb (72.58 kg), each processor module weighs ~2.5 lb (1.13 kg)
Power dissipation	1600W with a maximum configuration and 1 AC-input power supply 1600W with a maximum configuration and 1 DC-input power supply 1700W nominal with a maximum configuration and either 2 AC-input or 2 DC-input power supplies
Heat dissipation	1600W (5461 Btu/hr)
AC-input voltage	100 to 240 VAC
Frequency	50/60 Hz
AC-input cable[1]	12 AWG, with 3 leads, an IEC-320 plug on the router end, and a country-dependent plug on the power source end
AC-input voltage and current	100 VAC at 16 amps (A) maximum, wide input with power factor corrector (PFC) 240 VAC at 7A maximum
DC-input voltage and current	–48 VDC nominal at 35A in North America (–60 VDC at 35A in the European Union)
DC-input cable	8 AWG (recommended minimum), with 3 leads and rated for at least 194 F(90 C)(you supply the cable)
Power distribution	+5.2 VDC @ 75A, +12 VDC @ 15A, –12 VDC @ 3A, +24 VDC @ 5A
Airflow/noise level	Bottom to top through chassis by variable-speed blower (62 to 70 dBA)
Temperature	32 to 104 F (0 to 40 C), operating; –4 to 149 F (–20 to 65 C), nonoperating
Relative humidity	10 to 90%, noncondensing
Software requirement	RSP2 – Cisco IOS Release 10.3(6) or a later release of 10.3 RSP4/4+ – Cisco IOS Release 11.1(8)CA or a later release of 11.1 RSP8 – Cisco IOS Release 12.0(9)S or a later release of 12.0 S RSP16 – Cisco IOS Release 12.1(12)E and later and Cisco IOS 12.0(21.02)S and later
Agency approvals	Safety: UL 1950, CSA 22.2-950, EN60950, EN41003, TS001, AS/NZS 3260 EMI: FCC Class A, EN60555-2, EN55022 Class B, VDE 0878 Part 3, 30 Class B Immunity: EN55101/2 (ESD), EN55101/3 (RFI), EN55101/4 (Burst), EN55101/5 (Surge), EN55101/6 (Conducted), IEC77B (AC Disturbance)

1. The Cisco 7513-MX requires a minimum of 20A service with a 20A receptacle at the power source. The power cable supplied with the Cisco 7513-MX uses a 20A male plug.

Cisco 7576 Overview

The Cisco 7576 router supports multiprotocol, multimedia routing and bridging with a wide variety of protocols and any combination of available electrical interfaces and media. The Cisco 7576 consists of two independent Cisco 7500 series routers configured on a single split backplane. This system is housed within the chassis footprint of a Cisco 7513 router.

Network interfaces reside on interface processors that provide a direct connection between the two independent dual CyBuses located on the backplane of the Cisco 7576 and your external networks. The two independent dual CyBuses facilitate the configuration of two independent routers on a single backplane. These routers are identified as router A and router B.

The backplane of the Cisco 7576 has 13 slots. Router A uses interface processor slots 0 through 5 with a Route Switch Processor (RSP4/4+ or RSP8) in slot 6. Router B uses interface processor slots 8 through 12 with a Route Switch Processor (RSP4/4+ or RSP8) in slot 7. The Cisco 7576 supports 10 VIPs, one for each interface processor slot; 6 VIPs are supported in Router A and 5 VIPs are supported in Router B.

There are bays for up to two AC-input or DC-input power supplies. The chassis will operate with one power supply. Although a second power supply is not required, it allows load sharing and increased system availability.

Caution Because of agency compliance and safety issues, mixing AC-input and DC-input power supplies in the same Cisco 7576 is not a supported configuration and should not be attempted. Doing so might cause damage.

Note The Cisco 7576 is sold as a new unit and as an upgrade kit to the Cisco 7513. When purchased new, the Cisco 7576 comes standard with two AC-input power supplies and two RSP4/4+s. The Cisco 7576 upgrade kit includes only the system chassis, which includes the card cage and backplane. The upgrade kit does not include power supplies, RSPs, or interface processors. These parts are exchanged with the parts from the Cisco 7513 unit that is being upgraded. If you purchased a Cisco 7576 upgrade kit, refer to the document *Cisco 7513 and Cisco 7576 Chassis Replacement and Upgrade Instructions*.

Figure 1-16 shows the front view of the Cisco 7576. The three front-panel LEDs indicate system and power supply status, and LEDs on the RSP, interface processors, and power supplies indicate status.

Figure 1-16 Cisco 7576 (Front View)

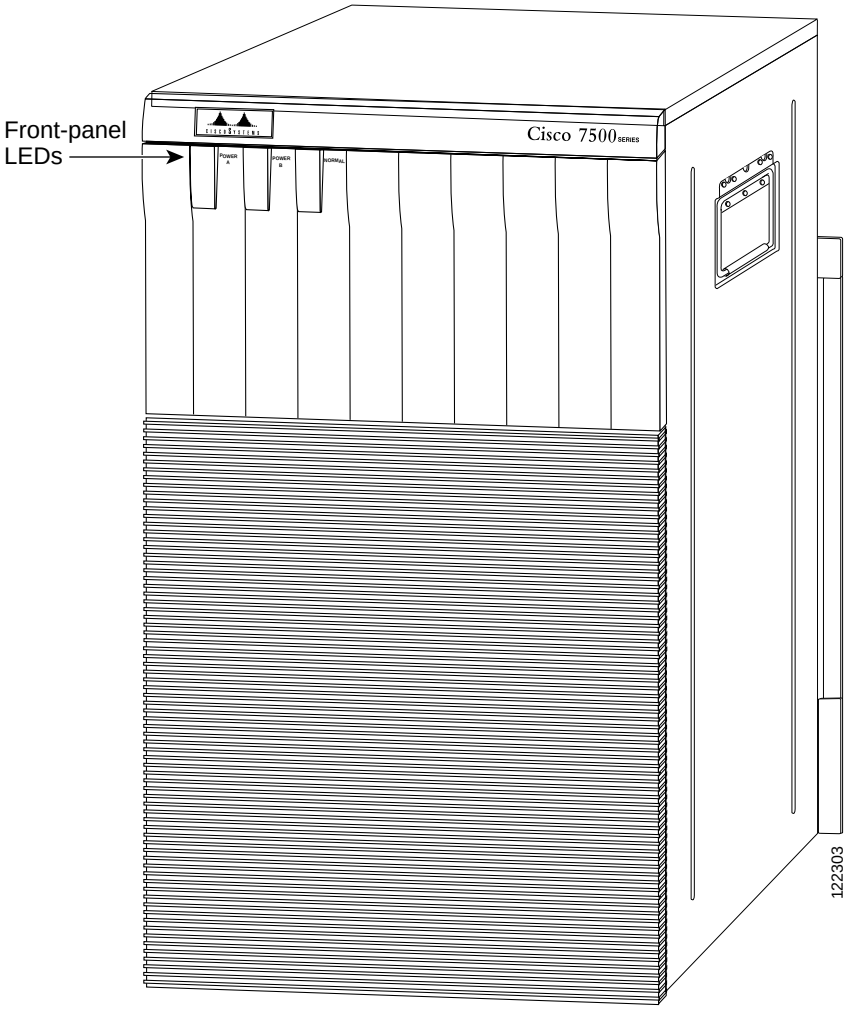
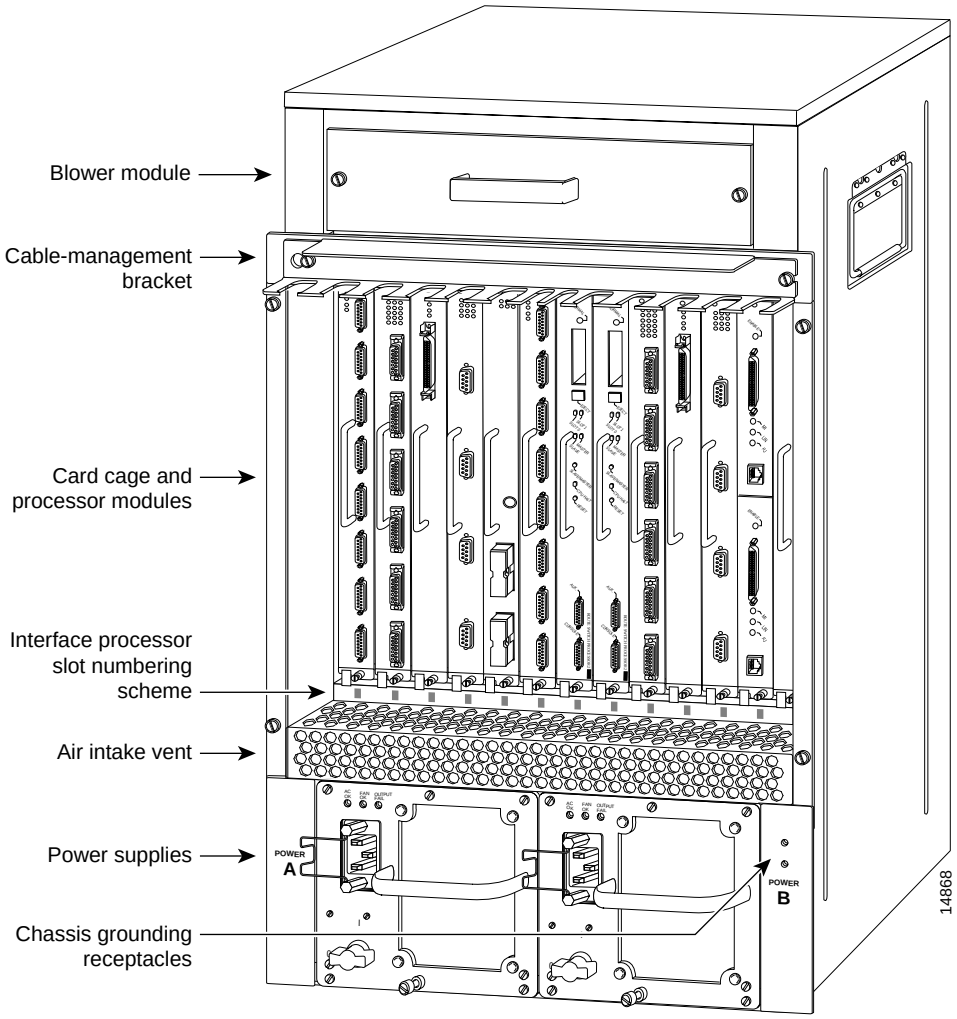


Figure 1-17 shows details on the rear, interface-processor end of the Cisco 7576.

Figure 1-17 Cisco 7576 (Rear View)



Note The Cisco 7513 and Cisco 7576 use the same chassis, power supplies, cover panels, and accessories. Externally, the two models appear the same. However the backplane and interface processor slot numbering scheme are different. See Figure 1-19 for an enlarged view of the Cisco 7576 interface processor slot numbering scheme. This area visually identifies which router model you have.

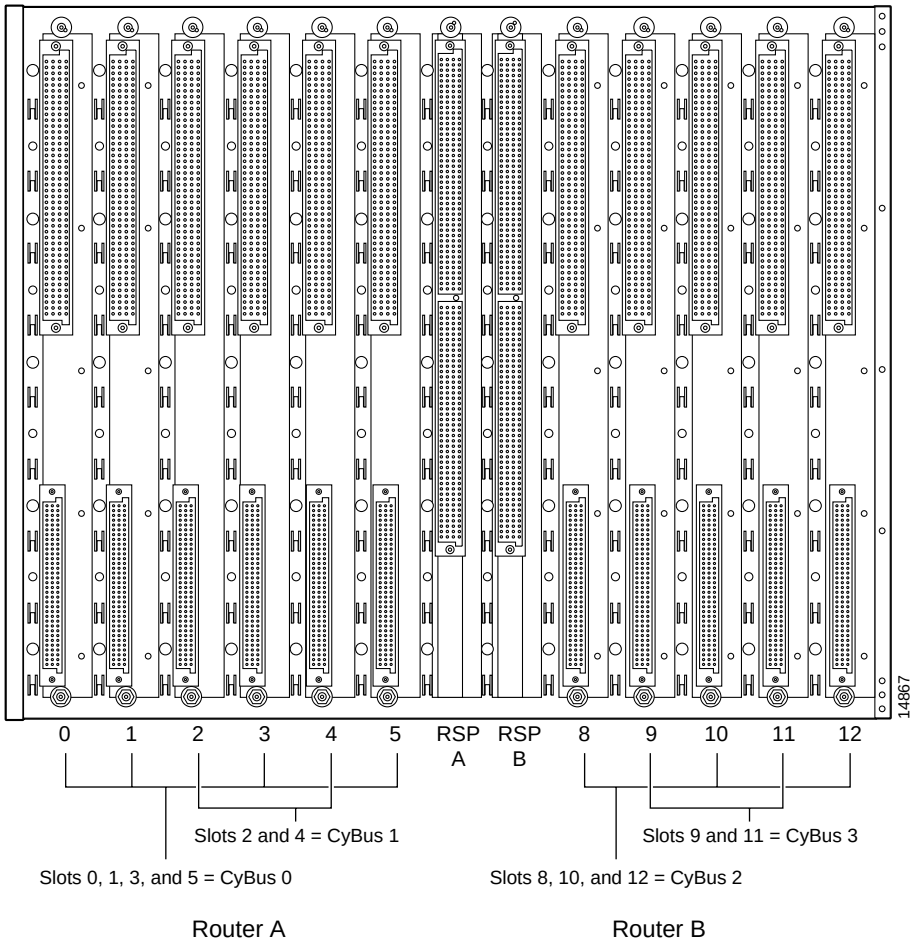
Cisco 7576 Dual CyBus Backplane

The Cisco 7576 features two dual CyBuses, creating two independent routers on one split backplane. The dual CyBus backplane, located at the rear of the removable card cage, provides the physical connections for the RSPs and interface processors, and transfers information at up to 2.134 Gbps (1.067 Gbps per CyBus) per router.

An RSP4/4+ or RSP8 in slot 6 controls router A and both CyBus 0 and CyBus 1. An RSP4/4+ or RSP8 in slot 7 controls router B and both CyBus 2 and CyBus 3. The dual CyBus backplane in the Cisco 7576 has an aggregate bandwidth of 2.134 Gbps per router. Interface processors connected to the set of CyBuses on router A are unaffected by the traffic generated by the interface processors connected to the set of CyBuses on router B. The dual CyBuses assigned to router A are independent of the dual CyBuses assigned to router B.

Figure 1-18 shows the details of the dual CyBus backplane.

Figure 1-18 Cisco 7576 Dual CyBus Backplane



Note The Cisco 7576 backplane includes connectors for time-division multiplexing (TDM)-compatible hardware. These connectors allow you to connect the Cisco 7576 to future TDM hardware as it becomes available.

The backplane slots are keyed so that the processor modules can be installed only in the slots designated for them. Keys on the backplane fit into two key guides on each module. Although the RSP uses unique keys, all 11 interface processor slots use the same key, so you can install an interface processor in any interface processor slot, but not in the RSP slot.

For maintenance information about the card cage assembly, see the "Removing and Replacing the Cisco 7513, Cisco 7513-MX, and Cisco 7576 Card Cage Assembly" section on page 7-5.

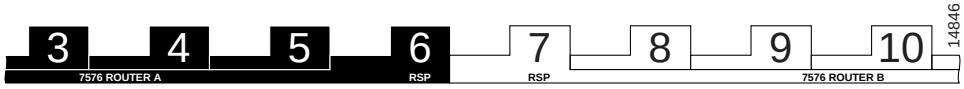
Identifying Cisco 7576 Independent Routers and CyBuses

The Cisco 7576 dual CyBus backplane includes 13 slots and provides two independent routers on a split backplane, designated router A and router B.

The interface processor slot numbering scheme (see Figure 1-19) on the card cage of the Cisco 7576 provides easy identification of the independent routers, CyBuses, and slots that make up the Cisco 7576 backplane. The scheme uses color coding to help you differentiate between the independent router and CyBus assignments.

- White text on dark-colored backgrounds identifies router A components:
  - CyBus 0 is assigned interface processor slots 0, 1, 3, and 5 (white on red).
  - CyBus 1 is assigned interface processor slots 2 and 4 (white on blue).
  - The RSP for router A is assigned slot 6 (white on dark gray).
- Dark gray text on light-colored backgrounds identifies router B components:
  - CyBus 2 is assigned interface processor slots 8, 10, and 12 (dark gray on yellow).
  - CyBus 3 is assigned interface processor slots 9 and 11 (dark gray on light green).
  - The RSP for router B is assigned slot 7 (dark gray on white).

Figure 1-19 Enlarged View of the Cisco 7576 Interface Processor Slot Numbering Scheme



Note To provide a viewable image, slot numbers 0, 1, 2, 11, and 12 are not shown in Figure 1-19. The slot numbering scheme uses color coding to assist in identifying routers and CyBus assignments.

CyBus Slot Number Assignments

The slot number assignments of the independent router CyBuses are separated by design. This facilitates automatic distribution of the system load across the CyBuses as interface processors are added. This design also provides better electrical flow and improves signal timing on the backplane.

Caution If you are only configuring one of the two routers that make up the Cisco 7576, make sure to configure router A instead of router B. To configure router A, install an RSP4/4+ or RSP8 in slot 6, and install interface processors in slots 0 through 5.

Cisco 7576 System Specifications

Table 1-6 lists the specifications for the Cisco 7576 system.

Table 1-6 Cisco 7576 Specifications

Description	Specification
Backplane	Four 1.0677-Gbps CyBuses divided into sets of 2 creating 2 independent routers: 6 interface processor slots and 1 RSP slot designated as router A, and 5 interface processor slots and 1 RSP slot designated as router B
Dimensions (H x W x D)	33.75 x 17.5 x 22 in. (85.73 x 44.45 x 55.88 cm) Chassis width including rack-mount flanges is 18.93 in. (48.1 cm) Chassis depth including power cables and cable-management bracket is 24 in. (60.96 cm)
Weight	Chassis with blower module: 75 lb (34.02 kg) Chassis with blower module and 1 power supply: 100 lb (45.36 kg) Chassis with blower module and 2 power supplies: 125 lb (56.7 kg) Chassis with blower module, 2 power supplies, and all slots filled: ~160 lb (72.58 kg), each processor module weighs ~2.5 lb (1.13 kg)
Power dissipation	1600W with a maximum configuration and 1 AC-input power supply 1600W with a maximum configuration and 1 DC-input power supply 1700W nominal with a maximum configuration and either 2 AC-input or 2 DC-input power supplies
Heat dissipation	1600W (5461 Btu/hr)
AC-input voltage	100 to 240 VAC
Frequency	50/60 Hz
AC-input cable[1]	12 AWG, with 3 leads, an IEC-320 plug on the router end, and a country-dependent plug on the power source end
AC-input voltage and current	100 VAC at 16 amps (A) maximum, wide input with power factor correction (PFC) 240 VAC at 7A maximum
DC-input voltage and current	–48 VDC nominal at 35A in North America (–60 VDC at 35A in the European Union)
DC-input cable	8 AWG (recommended minimum), with 3 leads and rated for at least 194 F(90 C)(you supply the cable)
Power distribution	+5.2 VDC @ 75A, +12 VDC @ 15A, –12 VDC @ 3A, +24 VDC @ 5A
Airflow/noise level	Bottom to top through chassis by variable-speed blower (62 to 70 dBA)
Temperature	32 to 104 F (0 to 40 C), operating; –4 to 149 F (–20 to 65 C), nonoperating
Relative humidity	10 to 90%, noncondensing
Software requirement	RSP4/4+ – Cisco IOS Release 11.1(22)CC, or a later release of 11.1 RSP8 – Cisco IOS Release 12.0(9)S or a later release of 12.0 S
Agency approvals	Safety: UL 1950, CSA 22.2-950, EN60950, EN41003, TS001, AS/NZS 3260 EMI: FCC Class A, EN60555-2, EN55022 Class B, VDE 0878 Part 3, 30 Class B Immunity: EN55101/2 (ESD), EN55101/3 (RFI), EN55101/4 (Burst), EN55101/5 (Surge), EN55101/6 (Conducted), IEC77B (AC Disturbance)

1. The Cisco 7576 requires a minimum of 20A service with a 20A receptacle at the power source. The power cable supplied with the Cisco 7576 uses a 20A male plug.

Route Switch Processor Overview

The main system processor in the Cisco 7500 series routers is the Route Switch Processor (RSP). The current RSP models sold are: RSP4+, RSP8 and RSP16.. The RSP1, RSP2 and RSP4 are legacy models. For more information on any of these products, refer to http://www.cisco.com/univercd/cc/td/doc/product/core/cis7505/rte_swit/index.htm for additional information on these models. The RSPs have common hardware features, and hardware features that differentiate one from the other.

The following sections first describe hardware features that are specific to each RSP model, and then describe features that are common to all RSPs.

RSP-Specific Hardware Features

The following sections describe hardware features that are specific to each of the RSPs used in the Cisco 7500 series. Select the appropriate section based on the RSP and Cisco 7500 series router that you have:

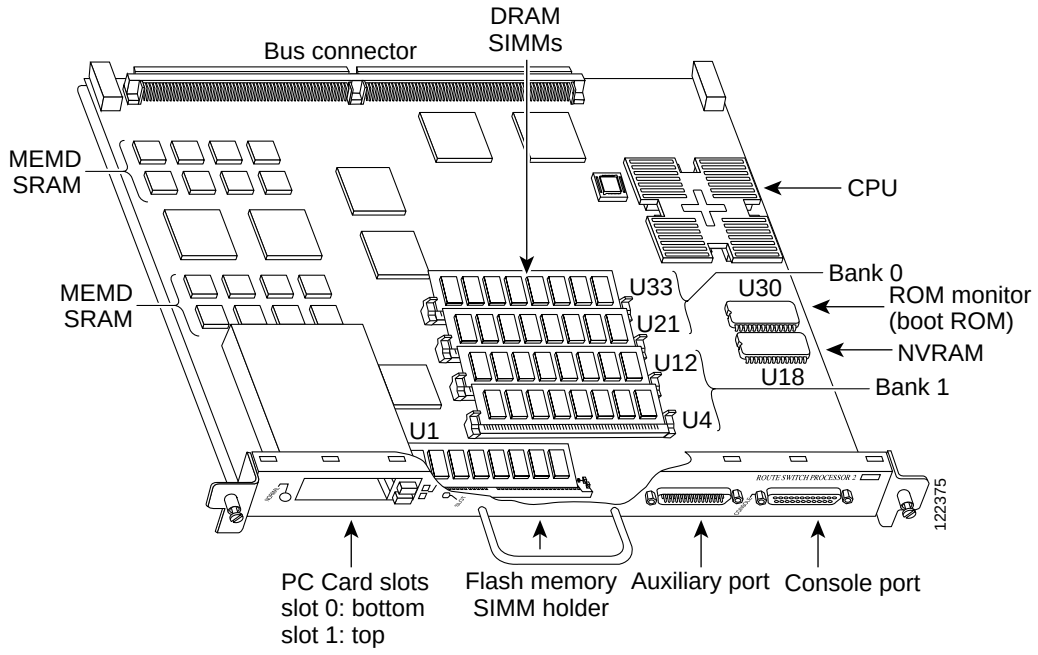
- RSP2—Cisco 7505, page 1-31
- RSP4/4+—Cisco 7507, Cisco 7513, and Cisco 7576, page 1-33
- RSP8—Cisco 7507-MX and Cisco 7513-MX, page 1-36
- RSP16—Cisco 7507, Cisco 7507-MX, Cisco 7513, and Cisco 7513-MX, page 1-39

RSP2—Cisco 7505

The RSP2, shown in Figure 1-20, is the main system processor for the Cisco 7505 router, and provides switched routing and high-speed switching functions.

The RSP2 is installed in the top slot in the Cisco 7505, which is labeled Slot 4 on the backplane and RSP to the left of the slots. (See Figure 1-3.) An RSP4 can also be used in the Cisco 7505. (See the "RSP4/4+—Cisco 7507, Cisco 7513, and Cisco 7576" section on page 1-33.) An RSP8 can also be used in the Cisco 7505. (See the "RSP8—Cisco 7507-MX and Cisco 7513-MX" section on page 1-36.)

Figure 1-20 Route Switch Processor (RSP2)



The RSP2 contains the system CPU, the system software (in Flash memory), the system memory components, and two PC Card slots, formerly called Personal Computer Memory Card International Association (PCMCIA) slots, and it maintains and executes the management functions that control the system.

Although no monitoring of 12V or temperature is done by the RSP2, a comparator device ensures that 12Vis maintained within the normal operating ranges, and three temperature sensors on the RSP2 send temperature information to the chassis interface (CI) card. The CI card reports all voltage and temperature readings, and these readings are available through standard software commands for environmental monitoring.

The RSP2 uses a software-controlled configuration register, so you do not have to remove the RSP2 to configure jumpers. There are no user-configurable jumpers on the RSP2.

The RSP2 contains the following components:

- R4600— Reduced Instruction Set Computing (RISC) processor, used for the CPU. The CPU runs at an external clock speed of 50 MHz and an internal clock speed of 100 MHz.
- Most of the memory components used by the system, including onboard Flash memory. (A bank of hardware [MAC-layer] addresses for the interface ports is contained in an NVRAM device on the backplane.)
- Air-temperature sensors for environmental monitoring. (All of the logic for the environmental monitoring functions is contained on the chassis interface card.)

In addition to the system software, the RSP2 contains and executes the following management functions that control the system:

- Sending and receiving routing protocol updates.
- Managing tables and caches.
- Monitoring interface and environmental status.

- Providing Simple Network Management Protocol (SNMP) management and the interface between the console and Telnet.
- Combining all of the switched routing and high-speed switching functions that communicate with and control the interface processors on the dual CyBus. This switching section decides the destination of a packet and switches it accordingly.

The RSP2 supports high system availability (HSA), which is a feature in Cisco IOS Release 11.1(4) or later, allowing two RSPs to be used in a Cisco 7507, Cisco 7507-MX, Cisco 7513, or Cisco 7513-MX router.

Note The Cisco 7576 uses only one RSP slot per router, designated router A and router B; therefore, it does not support HSA. The Cisco 7505 has only one RSP slot; therefore, it also does not support the HSA feature.

The RSP2 ships as Product Numbers RSP2 and RSP2=.

The RSP2 contains most of the memory components used by the system. Table 1-7 lists the functions of each type of memory on the RSP2.

Table 1-7 RSP2 Memory Components

Type	Size	Quantity	Description	Location
DRAM	16 to 128 MB	2 to 4	8-, 16-, or 32-MB SIMMs (based on maximum DRAM required)	U21 and U33 U12 and U4
SRAM	1 MB (fixed)	–	SRAM for packet buffering functions (MEMD)	–
	512 KB (fixed)	–	SRAM for secondary CPU cache memory functions	–
NVRAM	128 KB	1	Nonvolatile SRAM for the system configuration file[1]	U18
Flash Memory: SIMM	8 MB	1	Contains the Cisco IOS images on the RSP2.	U1
PC Cards	8, 16, and 20 MB[2]	Up to 2	Contains the Cisco IOS images on up to 2 PC Cards	Slot 0 and slot 1
Boot ROM[3]	256 KB	1	EPROM for the ROM monitor program	U30

1. A system configuration file is contained in NVRAM, which allows the Cisco IOS software to control several system variables.
2. Only Intel Series 2 Flash memory cards can be used with the RSP2.
3. With the RSP2, the HSA feature requires boot ROM Version 11.1(2) or later.

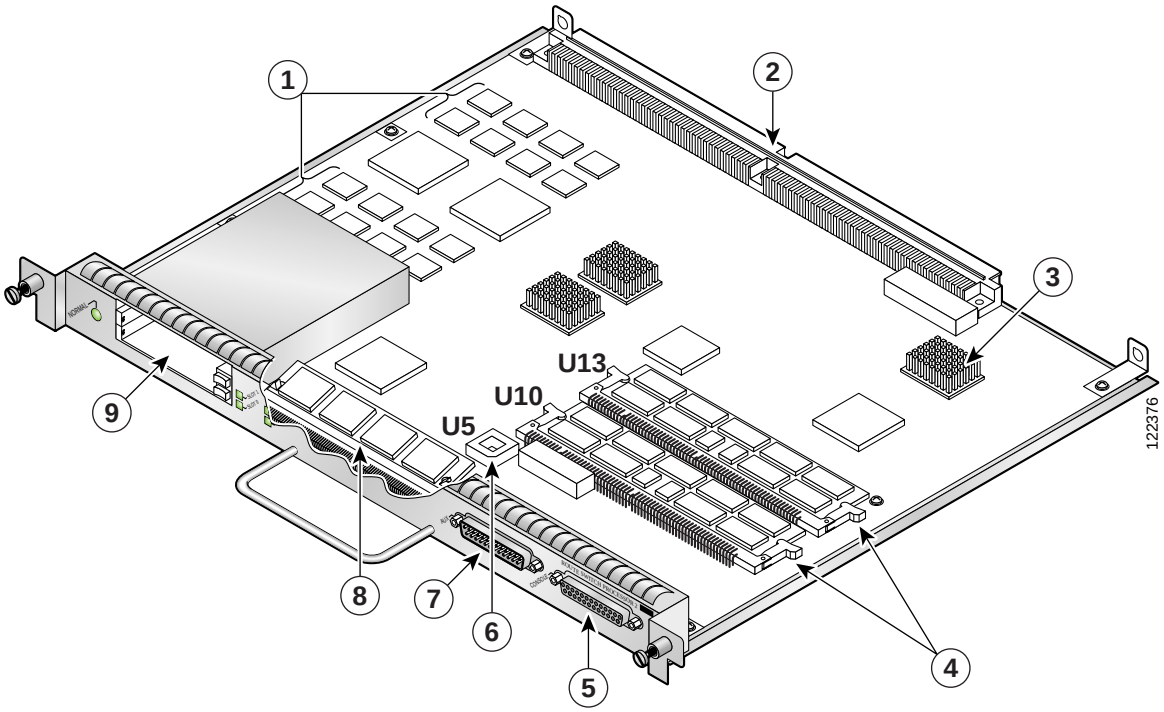
Note For RSP2 DRAM upgrade procedures, see Chapter 9, "Replacing DRAM on the Route Switch Processor."

RSP4/4+—Cisco 7507, Cisco 7513, and Cisco 7576

The RSP4/4+ shown in Figure 1-21, is the main system processor for the Cisco 7507, Cisco 7513, and Cisco 7576 routers. The RSP4/4+ provides switched routing and high-speed switching functions.

You install the RSP4/4+ in slot 2 or slot 3 in the Cisco 7507 (see Figure 1-5), or in slot 6 or slot 7 in the Cisco 7513 (see Figure 1-11) and Cisco 7576 (see Figure 1-17). The RSP4/4+ is also compatible with the Cisco 7505, where it is installed in slot 4 (see Figure 1-2).

Figure 1-21 Route Switch Processor (RSP4/4+)



1	MEMD SRAM	**6**	Flash EPROM (ROMmon) U5
2	Bus connector	**7**	Auxiliary port
3	CPU	**8**	Flash memory SIMM holder
4	DRAM DIMMs (bank 0: bottom) U10 DRAM DIMMs (bank1: top) U13	**9**	PC Card slot 0: bottom PC Card slot 1: top (For Flash memory cards)
5	Console port		

The RSP4/4+ contains the system CPU, the system software (in Flash memory), the system memory components, and two PC Card slots, and it maintains and executes the management functions that control the system.

Although no monitoring of 12V or temperature is done by the RSP4/4+, a comparator device ensures that 12V is maintained within the normal operating ranges, and three temperature sensors on the RSP4/4+ send temperature information to the chassis interface (CI) card. The CI card reports all voltage and temperature readings, and these readings are available through standard software commands for environmental monitoring. The RSP4/4+ uses a software-controlled configuration register, so you do not have to remove the RSP4/4+, to configure jumpers. There are no user-configurable jumpers on the RSP4/4+.

The RSP4/4+ contains the following components:

- IDT R5000 Reduced Instruction Set Computing (RISC) processor, used for the CPU. The CPU runs at an external bus clock speed of 100 MHz and an internal clock speed of 200 MHz.
- Up to 256 megabytes (MB) of parity-protected, dynamic random-access memory (DRAM) on two dual in-line memory modules (DIMMs); 32 MB of DRAM is the default shipping configuration.
- 2 MB of parity-protected, static random-access memory (SRAM) for packet buffering, and 512 KB of SRAM for secondary CPU cache memory functions. (SRAM is *not* user- configurable.)
- Most of the additional memory components used by the system, including onboard Flash memory and up to two PC Cards. (A bank of hardware [MAC-layer] addresses for the interface port is contained in an NVRAM device on the router backplane.)
- Air-temperature sensors for environmental monitoring. (All of the logic for the environmental monitoring functions is contained on the router interface card.)

In addition to running the system software from DRAM, the RSP4/4+ contains and executes the following management functions that control the system:

- Sending and receiving routing protocol updates.
- Managing tables and caches.
- Monitoring interface and environmental status.
- Providing Simple Network Management Protocol (SNMP) management and the interface between the console and Telnet.
- Combining all of the switched routing and high-speed switching functions that communicate with and control the interface processors on the dual CyBus. This switching section decides the destination of a packet and switches it accordingly.

The RSP4/4+ supports high system availability (HSA), which is a feature in Cisco IOS Release 11.1(4) or later, allowing two RSPs to be used in a Cisco 7507, Cisco 7507-MX, Cisco 7513, or Cisco 7513-MX router. By default, the system master is the RSP that occupies the first RSP slot in the router: slot 2 in the Cisco 7507, and slot 6 in the Cisco 7513.

Note The Cisco 7576 uses only one RSP slot per router, designated router A and router B; therefore, it does not support HSA. The Cisco 7505 has only one RSP slot; therefore, it also does not support the HSA feature. The RSPs in these models are automatically the system master for their respective routers.

The RSP4/4+ ships as the following product numbers:

- As a spare part, as Product Number RSP4=
- Bundled with and installed in Cisco 7500 series routers, as the following product numbers:
  - Product Number CISCO7505/4(=), a Cisco 7505 with one installed RSP4.
  - Product Number CISCO7507/4(=), a Cisco 7507 with one installed RSP4.
  - Product Number CISCO7513/4(=), a Cisco 7513 with one installed RSP4.
  - Product Number CISCO7507/4x2(=), a Cisco 7507 with two installed RSP4s.
  - Product Number CISCO7513/4x2(=), a Cisco 7513 with two installed RSP4s.
  - Product Number CISCO7576(=), a Cisco 7576 with two installed RSP4s. (This is the default configuration when the Cisco 7576 is purchased new and not upgraded from a Cisco 7513.)

The RSP4/4+ contains most of the memory components used by the system. Table 1-8 lists the functions of each type of memory on the RSP4/4+.

Table 1-8 RSP4/4+ Memory Components

Type	Size	Quantity	Description	Location
DRAM	32[1] to 256 MB DIMMs	1 or 2	32-, 64-, or 128-MB DIMMs (based on DRAM required) for main Cisco IOS image functions	U10 or U10 and U13
SRAM[2]	2 MB (fixed)	–	SRAM for packet buffering functions (MEMD)	–
	512 KB (fixed)	–	SRAM for secondary CPU cache memory functions	–
NVRAM	128 KB	1	Nonvolatile SRAM for the system configuration file[3]	–
Flash memory	8-MB SIMM	1	Contains the Cisco IOS images on the RSP4/4+	U1
	16[4] and 20 MB PC Cards	Up to 2	Contains the Cisco IOS images on up to 2 PC Card-based Flash memory cards[5]	Slot 0 and slot 1
Flash boot ROM	256 KB	1	Flash EPROM for the ROM monitor program image	U5

1. 32 MB is the default DRAM configuration for the RSP4/4+.
2. SRAM is not user-configurable or field-replaceable.
3. A system configuration file in NVRAM allows the Cisco IOS software to control several system variables.
4. A 16-MB Flash memory card is the default shipping configuration for the RSP4/4+ products.
5. Type I, Type II, and Type III PC Cards can be used in PC Card slot 1, and Type I and Type II PC Cards can be used in PC Card slot 0.

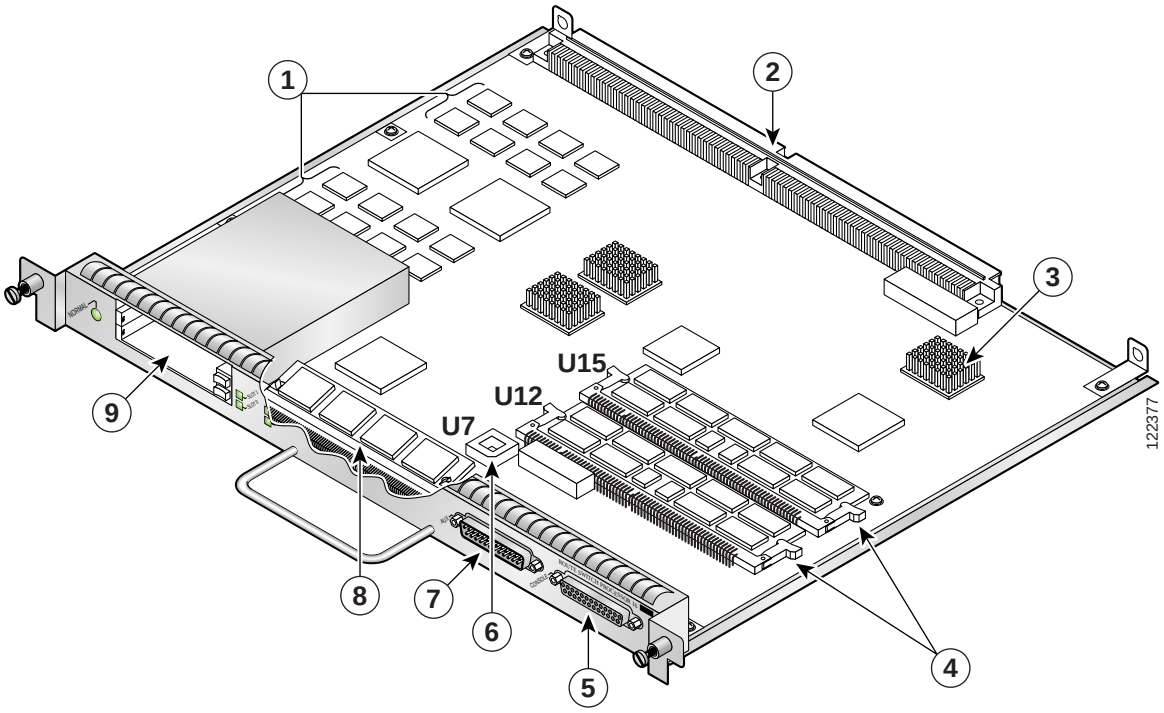
Note For RSP4/4+ DRAM upgrade procedures, see Chapter 9, “Replacing DRAM on the Route Switch Processor.”

RSP8—Cisco 7507-MX and Cisco 7513-MX

The RSP8, shown in Figure 1-22, is the main system processor for the Cisco 7507-MX and Cisco 7513-MX routers. The RSP8 provides switched routing and high-speed switching functions.

You install the RSP8 in slot 2 or slot 3 in the Cisco 7507-MX (see Figure 1-8) or in slot 6 or slot 7 in the Cisco 7513-MX (see Figure 1-14). The RSP8 is also compatible with the Cisco 7505, where it is installed in slot 4 (see Figure 1-2), the Cisco 7507, where it is installed in slot 2 or slot 3 (see Figure 1-5), the Cisco 7513, where it is installed in slot 6 or slot 7 (see Figure 1-11), and the Cisco 7576 where it is installed in slot 6 or slot 7 (see Figure 1-17).

Figure 1-22 Route Switch Processor (RSP8)



1	MEMD SRAM	**6**	Flash EPROM (ROMmon)
2	Bus connectors	**7**	Auxiliary port
3	CPU	**8**	Flash memory SIMM holder
4	DRAM DIMMs (bank 0: bottom) DRAM DIMMs (bank 1: top)	**9**	PC Card slot 0: bottom PC Card slot 1: top (for Flash Disks or Memory Cards
5	Console port		

The RSP8 contains the system CPU, the system software (on a Flash Disk), the system memory components, and two PC Card slots, and it maintains and executes the management functions that control the system.

Although no monitoring of 12V or temperature is done by the RSP8, a comparator device ensures that 12Vis maintained within the normal operating ranges, and three temperature sensors on the RSP8 send temperature information to the chassis interface (CI) card. The CI card reports all voltage and temperature readings, and these readings are available through standard software commands for environmental monitoring. The RSP8 uses a software-controlled configuration register, so you do not have to remove the RSP8 to configure jumpers. There are no user-configurable jumpers on the RSP8.

The RSP8 contains the following components:

- R7000 Reduced Instruction Set Computing (RISC) processor, used for the CPU with 256 KB on-chip secondary (L2) cache. The CPU runs at an external bus clock speed of 100 MHz and an internal clock speed of up to 250 MHz.
- Up to 256 megabytes (MB) of parity-protected, dynamic random-access memory (DRAM) on two dual in-line memory modules (DIMMs); 64 MB of DRAM is the default shipping configuration. DRAM comes preconfigured as either two 32-MB DIMMs or one 64-MB DIMM.

- 8 MB of parity-protected, static random-access memory (SRAM) for packet buffering, and 2 MB of SRAM for tertiary (L3) CPU cache memory functions (SRAM is *not* user-configurable).
- Most of the additional memory components used by the system, including onboard Flash memory and up to two PC Cards. (A bank of hardware [MAC-layer] addresses for the interface port is contained in an NVRAM device on the router backplane.)
- Air-temperature sensors for environmental monitoring. (All of the logic for the environmental monitoring functions is contained on the router interface card.)

In addition to running the system software from DRAM, the RSP8 contains and executes the following management functions that control the system:

- Sending and receiving routing protocol updates
- Managing tables and caches
- Monitoring interface and environmental status
- Providing Simple Network Management Protocol (SNMP) management and the interface between the console and Telnet

The high-speed switching section of the RSP8 communicates with and controls the interface processors on the high-speed CyBus. This switching section of the RSP8 decides the destination of a packet and switches it based on that decision.

The RSP8 combines all of the switched routing and high-speed switching functions. The RSP8 supports the HSA feature, which allows two RSP8s to be used in a Cisco 7507, Cisco 7507-MX, Cisco 7513, or Cisco 7513-MX router. By default, the system master is the RSP8 that occupies the first RSP slot in the router: slot 2 in the Cisco 7507 and Cisco 7507-MX, and slot 6 in the Cisco 7513 and Cisco 7513-MX.

Note The RSP8 only supports the HSA feature when used with another RSP8. The Cisco 7505 and Cisco 7576 routers do not support the HSA feature.

The RSP8 is available as follows:

- As a spare part, as Product Number RSP8=
- Bundled with and installed in Cisco 7500 series routers, as follows:
  - Product Number CISCO7507/8-MX, a Cisco 7507 with a mix-enabled backplane and one installed RSP8
  - Product Number CISCO7513/8-MX, a Cisco 7513 with a mix-enabled backplane and one installed RSP8
  - Product Number CISCO7507/8x2-MX, a Cisco 7507 with a mix-enabled backplane and two installed RSP8s
  - Product Number CISCO7513/8x2-MX, a Cisco 7513 with a mix-enabled backplane and two installed RSP8s

The RSP8 contains most of the memory components used by the system. Table 1-9 lists the functions of each type of memory on the RSP8.

Table 1-9 RSP8 Memory Components

Type	Size	Quantity	Description	Location
DRAM	64-MB[1] to 256-MB DIMMs	1 or 2	Any combination of 32-MB, 64-MB, or 128-MB DIMMs (based on DRAM required) for main Cisco IOS image functions	U12 or U12 and U15[2]
SRAM[3]	8 MB (fixed)	–	SRAM for packet buffering functions (MEMD)	–
	2 MB (fixed)	–	SRAM for tertiary (L3) CPU cache memory functions	–
NVRAM	2 MB	1	Nonvolatile SRAM for the system configuration file[4]	–
Flash memory	16-MB SIMM	1	Contains the Cisco IOS images on the RSP8	U1
	40-MB[5] Flash Disk	Up to 2	Contains the Cisco IOS images on up to 2 Flash Disks[7]	Slot 0 or slot 0 and slot 1
	16-MB or 20-MB[6] Flash memory card	Up to 2	Contains the Cisco IOS images on up to 2 Flash memory cards[7]	Slot 0 or slot 0 and slot 1

1. 64 MB of DRAM is the default DRAM configuration for the RSP8. The board is preconfigured with either two 32-MB DIMMs or one 64-MB DIMM.
2. Note that the larger DRAM DIMM must be placed in the U12 socket.
3. SRAM is not user-configurable or field-upgradable.
4. A system configuration file in NVRAM allows the Cisco IOS software to control several system variables.
5. A 40-MB Flash Disk in slot 0 is the default shipping configuration for RSP8 products.
6. Optional Flash memory.
7. Type I, Type II, and Type III PC Cards can be used in PC Card slot 1, and Type I and Type II PC Cards can be used in slot 0.

Note For RSP8 DRAM upgrade procedures, see Chapter 9, “Replacing DRAM on the Route Switch Processor.”

RSP16—Cisco 7507, Cisco 7507-MX, Cisco 7513, and Cisco 7513-MX

The RSP16 is the latest-generation, main system processor module for the Cisco 7500 series routers.

The RSP16 supports the high system availability (HSA) feature, which allows two RSP16s (or an RSP16 and an RSP8) to be used in a Cisco 7507, Cisco 7507-MX, Cisco 7513, or Cisco 7513-MX router. The redundancy increases system availability during planned and unplanned network outages..

The RSP16 also supports high availability (HA), a series of features that operates similarly to HSA, but which further minimizes system downtime. (HSA is the system default.)

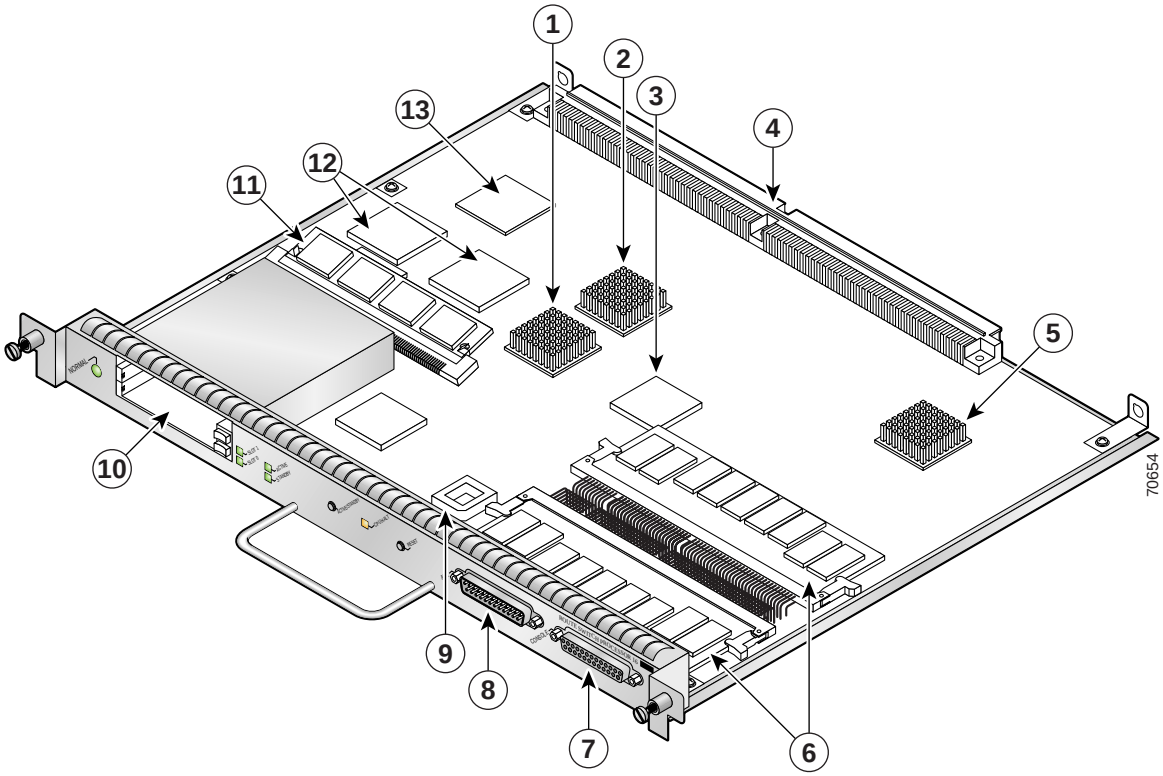
The RSP16 is not available as an upgrade to an existing RSP, but supports the VIP2, VIP4, and new VIP6-80. The RSP16 does not support legacy interface processors, except for the CIP2, GEIP, GEIP+, FEIP2-DSW-2TX, FEIP2-DSW-2FX, SRPIP, CX-CIP2-ECA1 and ECA2. The RSP16 contains the central processing unit (CPU) and most of the memory components for the router. The Cisco IOS software images reside in Flash memory, located as follows on the RSP16:

- In the form of a single in-line memory module (SIMM) (U1 in Figure 2)
- Up to two Flash Disks that insert in the two PC Card slots (slot 0 and slot 1)

Note For the Cisco IOS releases that are supported on the RSP16 refer to the Software Advisor at

Storing the IOS software images in Flash memory enables you to download and boot from upgraded Cisco IOS software images remotely or from software images resident in the RSP16 Flash memory, without having to remove and replace read-only memory (ROM) devices.

Figure 1-23 Route Switch Processor (RSP16)



1	Queues and Accumulators (QA) ASIC (U39)	**8**	
2	MEMD Control (MC) ASIC	**9**	
3	dBus FPGA	**10**	PC card slot 0: bottom PC card slot 1: top (For Flash Disks)
4	Bus connectors	**11**	Boot Flash SIMM
5	CPU	**12**	MEMD Data ASIC
6	SDRAM DIMMs (bank 0: bottom) SDRAM DIMMs (bank 1: top)	**13**	NVRAM
7	Console port		

The RSP16 also contains:

- Most of the additional memory components used by the system, including 16-MB onboard Flash memory and up to two Flash Disks (48 MB, 64 MB, or 128 MB per Flash Disk, with the 48-MB Flash Disk being the shipping default).

- Air-temperature sensors for environmental monitoring. (All of the logic for the environmental monitoring functions is contained on the router interface card.)

In addition to running the system software from DRAM, the RSP16 contains and executes the following management functions that control the system:

- Sending and receiving routing protocol updates
- Managing tables and caches
- Monitoring interface and environmental status
- Providing Simple Network Management Protocol (SNMP) management and the interface between the console and Telnet

The high-speed switching section of the RSP16 communicates with and controls the interface processors on the high-speed CyBus. This switching section of the RSP16 decides the destination of a packet and switches it based on that decision.

Note A bank of hardware MAC-layer addresses for the interface ports is contained in an NVRAM device on the router backplane.

Following are chassis slot requirements for ensuring RSP16 compatibility.

- You have no restrictions on installing an RSP16 in a Cisco 7505, however; the Cisco 7505 does not support the HSA or the HA features.
- You have no restrictions on installing an RSP16 in a Cisco 7507 or Cisco 7507-MX provided that you install the RSP16 in slot 2, slot 3, or both. With the HSA or HA features enabled, you will install an RSP16 (or an RSP8 and an RSP16) in both RSP slots.
- You have no restrictions on installing an RSP16 in a Cisco 7513 or Cisco 7513-MX provided that you install the RSP16 in slot 6, slot 7, or both. With the HSA or HA features enabled, you will install an RSP16 (or an RSP8 and an RSP16) in both RSP slots.
- It is assumed that if you install two RSP16s (or an RSP8 and an RSP16) in the Cisco 7507, Cisco 7507-MX, Cisco 7513, or Cisco 7513-MX, you plan to enable and configure the HSA or HA features

Table 1-10 RSP16 Memory Components

Type	Size	Quantity	Description	Location (See Figure 1-23
DRAM	128MB[1] to 516MB DIMMs	1 or 2	128-, 256-, or 516-MB DIMM[2] (based on DRAM required) for main Cisco IOS image functions	U130, or U130 and U180
SRAM[3]	8 MB (fixed)	–	SRAM for packet buffering functions (MEMD)	–
	2MB (fixed)	–	SRAM for tertiary (L3) CPU cache memory functions	–
NVRAM	2MB	1	Nonvolatile SRAM for the system configuration file[4]	U5
Flash Memory	16MB SIMM[5]	1	Contains the Cisco IOS images on the RSP16	U1
	48MB, 64MB[6], or 128MB Flash Disk	Up to 2	Contains the Cisco IOS images on up to two Flash Disks	Slot 0, or slot 0 and slot 1
Flash Boot ROM	512KB	1	Flash EPROM for the ROM monitor program image	U7

1. 128MB DRAM is the default DRAM configuration for the RSP16.

2. Do not mix memory sizes. If installing 2 DIMMs, both DIMMs must be the same size. If your router includes redundant RSPs, the RSPs should have the same memory size.
3. SRAM is not user-configurable or field-upgradable.
4. A system configuration file is contained in NVRAM, which allows the Cisco IOS software to control several system variables.
5. This 16-MB SIMM Flash memory is not supported on the RSP2, RSP4/4+, or RSP8.
6. A 64-MB Flash Disk is the default shipping configuration for the RSP16 product.

Common RSP Hardware Features

This section discusses hardware features common to all RSPs. (For convenience, the RSP2, RSP4/4+, RSP8, and RSP16 are referred to as the *RSP* with differences clearly noted.)

RSP LEDs

Several LEDs on the RSP indicate system and RSP status, as follows:

- Normal LED—On when the RSP is receiving +5V, this LED indicates a successful boot; however, it does not indicate the system has reached “normal” operation.
- CPU halt LED—Off during normal operation, this LED goes on only if the system detects a processor hardware failure.

  The RSP controls the normal and CPU halt LEDs and turns them on in parallel to indicate that the system is operational.
- Master/slave LEDs—These LEDs indicate whether an RSP2, RSP4/4+, or RSP8 is the master or slave in a system configured for the high system availability (HSA) feature.
- Slot 0 and slot 1 PC Card LEDs—These LEDs go on when a PC Card-based Flash memory card is being accessed in the respective PC Card slot.

Note The master/slave LED and the HSA feature are not supported on the Cisco 7505 or Cisco 7576.

RSP DRAM

Dynamic random-access memory (DRAM) stores routing tables, protocols, and network accounting applications. Table 1-11 lists the RSP DRAM configurations.

Table 1-11 RSP DRAM Configurations

RSP	DRAM Description
RSP2	Up to 128 MB available through SIMM upgrades. DRAM is contained in up to 4 SIMM sockets: U21 and U33 (also called bank 0) and U4 and U12 (also called bank 1)
RSP4/4+	Up to 256 MB available through DIMM upgrades. DRAM is contained in up to 2 DIMM sockets: U10 (also called bank 0) and U13 (also called bank 1)
RSP8	Up to 256 MB available through DIMM upgrades. DRAM is contained in up to 2 DIMM sockets: U12 (also called bank 0) and U15 (also called bank 1)

Caution To prevent memory problems, DRAM DIMMS must be 3.3V devices. Do not attempt to install higher-voltage devices (such as those designed for the RSP2) in the RSP4/4+ or RSP8 DIMM sockets.

RSP SRAM

RSP static random-access memory (SRAM) provides packet buffering and CPU cache memory functions. Table 1-12 lists the RSP SRAM configurations.

Table 1-12 RSP SRAM Configurations

RSP[1]	SRAM Description
RSP2	1 MB of SRAM for packet buffering, and 512 KB of secondary CPU cache SRAM
RSP4/4+	2 MB of SRAM for packet buffering, and 512 KB of secondary CPU cache SRAM
RSP8	8 MB of SRAM for packet buffering functions (MEMD)

1. RSP SRAM is not field-replaceable.

RSP NVRAM

RSP nonvolatile random-access memory (NVRAM) stores the system configuration and the environmental monitoring logs. It is backed up with built-in lithium batteries that retain the contents for a minimum of 5 years.

Note Before replacing an RSP, back up the running configuration to a Trivial File Transfer Protocol (TFTP) file server so that you can later retrieve it. If the configuration is not saved, the entire configuration will be lost—inside the NVRAM on the removed RSP—and you will have to reenter it manually. This procedure is not necessary if you are temporarily removing an RSP you will reinstall; lithium batteries retain the configuration in memory until you replace the RSP in the system.

RSP Flash Memory

Flash memory, either on a SIMM or on a Flash memory PC Card or Flash Disk, allows you to remotely load and store multiple Cisco IOS software and microcode images and to back up configurations on your Cisco 7500 series router.

You can download a new image over the network or from a local server and then add the new image to Flash memory or replace the existing files. You can then boot the routers either manually or automatically from any of the stored images. Flash memory also functions as a TFTP server to allow other servers to remotely boot from stored images or to copy them into their own Flash memory.

Note For specific Flash memory card procedures, see the "Using the Flash Memory Cards in the RSPs" section on page 4-20.

RSP EEPROM

An electrically erasable programmable read-only memory (EEPROM) component on the RSP stores board-specific information such as the board serial number, part number, controller type, hardware revision, and other details unique to each board. This EEPROM is not a spare and cannot be programmed in the field.

RSP Asynchronous Serial Ports—Console and Auxiliary

Two asynchronous EIA/TIA-232 serial ports on the RSP, the console and auxiliary ports, provide the means for connecting a terminal, modem, CSU, DSU, or other external device for configuring, managing, or connecting to the system. A data circuit-terminating equipment (DCE) EIA/TIA-232 receptacle console port on the RSP provides a direct connection for a console terminal.

Note EIA/TIA-232 was known as recommended standard RS-232 before its acceptance as a standard by the Electronic Industries Association (EIA) and Telecommunications Industry Association (TIA).

The adjacent DTE EIA/TIA-232 plug auxiliary port supports flow control and is often used to connect a modem, a DSU/CSU, or other optional equipment for Telnet management of the attached device.

The console and auxiliary ports support asynchronous transmission. Asynchronous transmission uses control bits to indicate the beginning and end of characters, rather than precise timing. Serial interface ports on serial interface processors and port adapters support synchronous transmission, which maintains precise clocking between the transmitter and receiver by sending frames of information that consist of separate clock signals along with the data signals.

Note When connecting serial devices, ensure that the devices support the proper transmission timing methods for the respective port: asynchronous for the console and auxiliary ports, and synchronous for the serial ports on serial interface processors and port adapters.

The following sections describe the pinouts for the console and auxiliary connectors and cables for the RSPs:

- RSP Console Port Pinout, page 1-44
- RSP Auxiliary Port Pinout, page 1-45
- RSP2, RSP4/4+, and RSP8 Console and Auxiliary Y-Cable Pinouts, page 1-45

(Specific differences between RSPs are clearly noted.)

Note The console and auxiliary cables are shown in Figure 3-22 on page 3-32. These cables can be used with all RSPs. The console Y-cable, CAB-RSP2(4)CON, and auxiliary Y-cable, CAB-RSP2(4)AUX, are shown in Figure 3-23 on page 3-33 and Figure 3-24 on page 3-33, respectively. These cables can be used with the RSP2, RSP4/4+, or RSP8 in the Cisco 7507 and Cisco 7513 routers.

RSP Console Port Pinout

The console port on the RSP is an EIA/TIA-232 DCE DB-25 receptacle. Both the Data Set Ready (DSR) and Data Carrier Detect (DCD) signals are active when the system is running. The console port does not support hardware flow or modem control. The console port requires a straight-through EIA/TIA-232 cable. Table 1-13 lists the console port pinout.

Table 1-13 RSP Console Port Pinout

Pin	Signal Direction	Signal Description
1	–	Ground (GND)
2	<—	Transmit Data (TxD)
3	—>	Receive Data RxD)
6	—>	Data Set Ready (DSR); always on
7	–	Ground (GND)
8	—>	Data Carrier Detect (DCD); always on

RSP Auxiliary Port Pinout

The auxiliary port on the RSP is an EIA/TIA-232 DTE DB-25 plug to which you can attach external equipment in order to access the router from the network. The Request To Send (RTS) signal tracks the state of the Clear To Send (CTS) input. The auxiliary port supports hardware flow control and modem control. Table 1-14 lists the auxiliary port pinout.

Table 1-14 RSP Auxiliary Port Pinout

Pin	Signal Direction	Signal Description
2	—>	Transmit Data (TxD)
3	<—	Receive Data (RxD)
4	—>	Request To Send (RTS); used for hardware flow control
5	<—	Clear To Send (CTS); used for hardware flow control
6	<—	Data Set Ready (DSR)
7	–	Signal Ground
8	<—	Carrier Detect (CD); used for modem control
20	—>	Data Terminal Ready (DTR); used for modem control only

RSP2, RSP4/4+, and RSP8 Console and Auxiliary Y-Cable Pinouts

The console and auxiliary Y-cables allow you to simultaneously connect the console or auxiliary ports on two RSP2s, two RSP4/4+s, two RSP8s or one of each, to one console terminal or external auxiliary device (such as a modem, and so forth). These are configured as system master and slave in RSP slots 2 and 3 in the Cisco 7507 and Cisco 7507-MX, and RSP slots 6 and 7 in the Cisco 7513 and Cisco 7513-MX.

Note The Cisco 7576 does not support master/slave configuration. In the Cisco 7576, the RSP in slot 6 is automatically the system master for router A and the RSP in slot 7 is automatically the system master for router B. The use of Y-cables is not supported on the Cisco 7576, and they are not included with the unit.

The two Y-cables ship with the Cisco 7507, Cisco 7507-MX, Cisco 7513, and Cisco 7513-MX chassis as Product Numbers CAB-RSP2CON and CAB-RSP2AUX, and are available as spare parts (=).

Table 1-15 lists the console Y-cable pinout, and Table 1-16 lists the auxiliary Y-cable pinout.

Table 1-15 Console Y-Cable Pinout

Female End DB-25 Pins	Male End DB-25 Pins	Description
P1-1	J1-1 and J2-1	Ground (GND)
P1-2	J1-2 and J2-2	Receive Data (RxD)
P1-3	J1-3 and J2-3	Transmit Data (TxD)
P1-4	J1-4 and J2-4	Clear To Send (CTS); looped to 5
P1-5	J1-5 and J2-5	Request To Send (RTS); looped to 4
P1-6	J1-6 and J2-6	Data Set Ready (DSR)
P1-7	J1-7 and J2-7	Ground (GND)
P1-8	J1-8 and J2-8	Data Carrier Detect (DCD)
P1-13	J1-13 and J2-13	YCBL Detect Ground
P1-19	J1-19 and J2-19	YCBL Detect
P1-20	J1-20 and J2-20	Data Terminal Ready (DTR)

Table 1-16 Auxiliary Y-Cable Pinout

Male End DB-25 Pins	Female End DB-25 Pins	Description
P1-1	J1-1 and J2-1	Ground (GND)
P1-2	J1-2 and J2-2	Transmit Data (TxD)
P1-3	J1-3 and J2-3	Receive Data (RxD)
P1-4	J1-4 and J2-4	Request To Send (RTS)
P1-5	J1-5 and J2-5	Clear To Send (CTS)
P1-7	J1-7 and J2-7	Ground (GND)
P1-8	J1-8 and J2-8	Data Carrier Detect (DCD)
P1-13	J1-13 and J2-13	YCBL Detect
P1-19	J1-19 and J2-19	YCBL Detect Ground
P1-20	J1-20 and J2-20	Data Terminal Ready (DTR)
P1-22	J1-22 and J2-22	Ring

AC-Input and DC-Input Power Supply Overview

The Cisco 7500 series routers support AC-input and DC-input power supplies. The Cisco 7505 uses one AC-input or DC-input power supply, whereas the Cisco 7507, Cisco 7507-MX, Cisco 7513, Cisco 7513-MX, and Cisco 7576 support dual AC-input *or* DC-input power supplies. Power specifications are listed in Table 1-1 (Cisco 7505), Table 1-2 (Cisco 7507), Table 1-3 (Cisco 7507-MX), Table 1-4 (Cisco 7513), Table 1-5 (Cisco 7513-MX), and Table 1-6 (Cisco 7576).

Caution To prevent system problems, do not mix power supply input types in the Cisco 7507, Cisco 7507-MX, Cisco 7513, Cisco 7513-MX, or Cisco 7576 routers. Both power supplies installed in a router must be *either* AC input or DC input. Do not attempt to install a DC-input power supply in a router with one AC-input power supply, or vice versa.

The DC-input power cable is not available from Cisco Systems; however, it is available from commercial cable vendors. DC-input power cable specifications are listed in Table 1-1 (Cisco 7505), Table 1-2 (Cisco 7507), Table 1-3 (Cisco 7507-MX), Table 1-4 (Cisco 7513), Table 1-5 (Cisco 7513-MX), and Table 1-6 (Cisco 7576).

For Cisco 7500 series routers used in North America, the following AC-input and DC-input power supplies are available:

- Cisco 7505—Product Numbers PWR/5AC(=) (see Figure 1-24) and PWR/5DC(=) (see Figure 1-25)
- Cisco 7507 and Cisco 7507-MX—Product Numbers PWR/7-AC(=) (see Figure 1-26) and PWR/7-DC(=) (see Figure 1-27)
- Cisco 7513, Cisco 7513-MX, and Cisco 7576—Product Numbers PWR-7513-AC(=) and PWR-7576-AC(=) (see Figure 1-28); and Product Numbers PWR-7513-DC(=) and PWR-7576-DC(=) (see Figure 1-29)

Figure 1-24 AC-Input Power Supply (Cisco 7505)

Figure 1-25 DC-Input Power Supply (Cisco 7505)

Figure 1-26 AC-Input Power Supply (Cisco 7507 and Cisco 7507-MX)

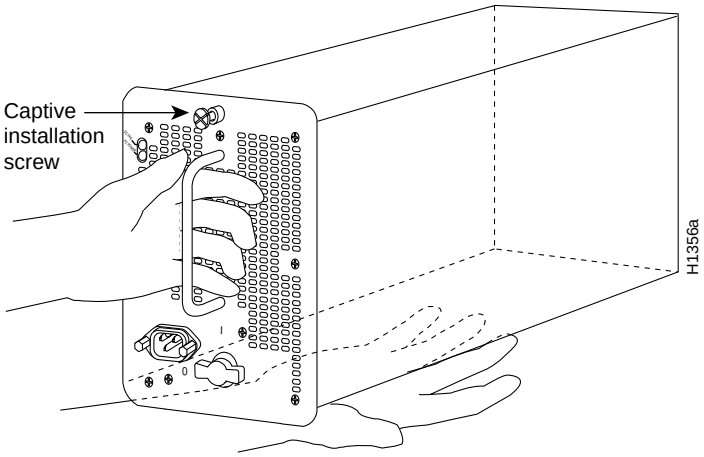


Figure 1-27 DC-Input Power Supply (Cisco 7507 and Cisco 7507-MX)

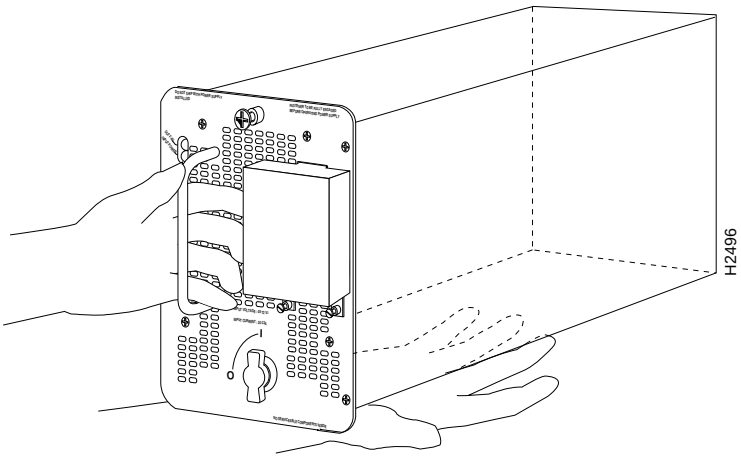


Figure 1-28 AC-Input Power Supply (Cisco 7513, Cisco 7513-MX, and Cisco 7576)

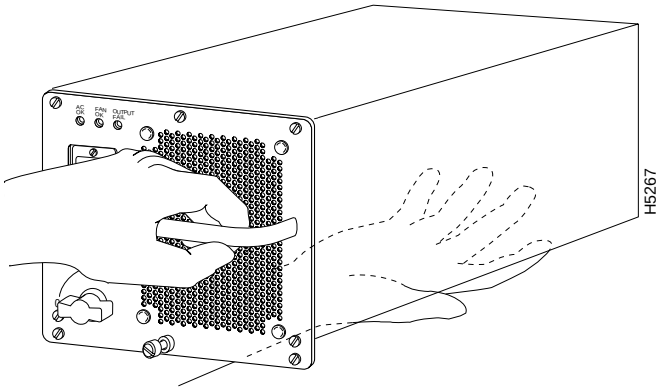
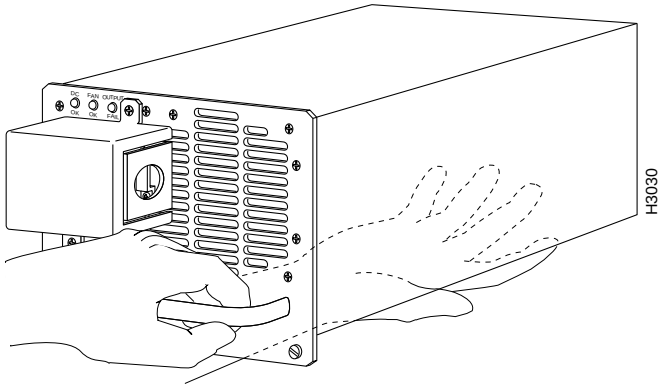


Figure 1-29 DC-Input Power Supply (Cisco 7513, Cisco 7513-MX, and Cisco 7576)



For Cisco 7500 series routers used in the United Kingdom (U), Australia (A), Italy (I), and the continental European (E) countries (excluding Italy), the following power supplies are available:

- Cisco 7505
  - AC input: Product Numbers PWR/5-ACU(=), PWR/5-ACA(=), PWR/5-ACI(=), PWR/5-ACE(=)
  - DC-input: Product Numbers PWR/5-DCU(=), PWR/5-DCA(=), PWR/5-DCI(=), PWR/5-DCE(=)
- Cisco 7507 and Cisco 7507-MX
  - AC input: Product Numbers PWR/7-ACU(=), PWR/7-ACA(=), PWR/7-ACI(=), PWR/7-ACE(=)
  - DC-input: Product Numbers PWR/7-DCU(=), PWR/7-DCA(=), PWR/7-DCI(=), PWR/7-DCE(=)
- Cisco 7513 and Cisco 7513-MX
  - AC input: Product Numbers PWR-7513-ACU(=), PWR-7513-ACA(=), PWR-7513-ACI(=), PWR-7513-ACE(=)
  - DC-input: Product Numbers PWR-7513-DCU(=), PWR-7513-DCA(=), PWR-7513-DCI(=), PWR-7513-DCE(=)
- Cisco 7576
  - AC input: Product Numbers PWR-7576-ACU(=), PWR-7576-ACA(=), PWR-7576-ACI(=), PWR-7576-ACE(=)
  - DC-input: Product Numbers PWR-7576-DCU(=), PWR-7576-DCA(=), PWR-7576-DCI(=), PWR-7576-DCE(=)

The AC-input and DC-input power supplies available for countries outside North America differ from the North American power supplies in the following ways: the operating (input) voltages of each power supply and the AC-input power cables that ship with the power supplies are specific to each country.

For power supply maintenance information, see the following sections as appropriate for your Cisco 7500 series router:

- For the Cisco 7505, see the "Removing and Replacing the Cisco 7505 Power Supply" section on page 5-13.
- For the Cisco 7507 and Cisco 7507-MX, see the "Removing Cisco 7507 and Cisco 7507-MX Power Supplies" section on page 6-3.

- For the Cisco 7513, Cisco 7513-MX, and Cisco 7576, see the "Removing Cisco 7513, Cisco 7513-MX, and Cisco 7576 Power Supplies" section on page 7-3.

Arbiter Overview

In the Cisco 7500 series routers, an internal printed circuit board called the *arbiter* arbitrates traffic on the CyBus and generates the CyBus clock.

The Cisco 7505 has a single arbiter, whereas the Cisco 7507 and Cisco 7513 have a dual arbiter for the dual CyBuses. The Cisco 7576 includes two dual arbiters, one for router A and one for router B. The arbiter is attached directly to the front (noninterface processor side) of the system backplane. It controls traffic across each CyBus by prioritizing access requests from interface processors to ensure that each request is processed and to prevent any interface processor from jeopardizing each CyBus and interfering with the ability of the other interface processors to access the RSP.

The arbiter provides the following services for the system:

- CyBus clock generation—Generates the internal system clock and provides a private copy of the clock to the RSP and each interface processor.
- CyBus arbitration—Arbitrates interface processor requests to transmit commands on the CyBus. The arbitration is based on a round-robin priority scheme to ensure that all interface processors have access to a known portion of each CyBus's bandwidth.
- Global lock arbitration—Arbitrates interface processor and RSP requests for the global lock, a synchronization primitive used to control RSP and interface processor access to shared data structures.

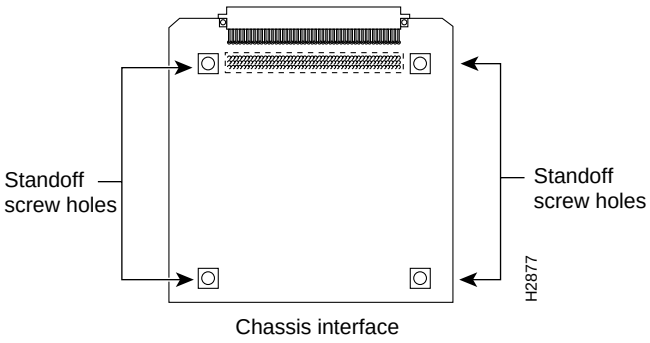
Note The Cisco 7507-MX, Cisco 7513-MX, and some models of the Cisco 7507 and Cisco 7513 ship with the Cisco turbo arbiter. The turbo arbiter, when used in conjunction with other future hardware, significantly increases system bandwidth. When not used with this future hardware, the turbo arbiter operates in standard CyBus mode. Refer to *Replacing the Dual Arbiter or Turbo Arbiter in Cisco 7500 Series Routers* publication for details on how to identify whether or not your Cisco 7507 or Cisco 7513 includes a turbo arbiter.

Chassis Interface Overview

The Cisco 7500 series routers have an internal printed board called the *chassis interface* (CI) that provides the environmental and power supply monitoring functions for the router. (See Figure 1-30.)

Note The CI is available as a FRU. The Cisco 7576 includes two chassis interfaces, one for router A and one for router B.

Figure 1-30 7500 Series Chassis Interface



The CI isolates the CPU and system software from chassis-specific variations, and is attached directly to the front (noninterface processor side) of the system backplane.

The functions of the CI are as follows:

- Report backplane type and arbiter type
- Monitor power supply and fan and blower status
- Monitor the temperature sensors on the RSP
- Provide router power up/down control and power supply power-down control

Note In the Cisco 7513 and Cisco 7513-MX, a hard shutdown is achieved by disabling the power source. In the Cisco 7576, both routers share the same power source. In the Cisco 7576, when one router senses a problem requiring a hard shutdown, the RSP and all interface processors installed in that router (only) are powered off. In the first 14 temperature cycles, the RSP and interface processors are powered back on once the temperature of the system falls below a certain temperature setpoint. At the fifteenth temperature cycle, this temperature setpoint is changed to a very low value, preventing the affected router from powering back up.

This achieves a hard shutdown of one router without affecting the other router. The RSP and interface processors will remain disabled until the power is manually recycled. This allows you to choose a suitable time to recycle the power when it will not adversely affect your users.

For CI maintenance information, see "Removing and Replacing the Chassis Interface in the Cisco 7505" section on page 5-11, "Removing and Replacing the Chassis Interface in the Cisco 7507 and Cisco 7507-MX" section on page 6-12, and "Removing and Replacing the Chassis Interface in the Cisco 7513, Cisco 7513-MX, and Cisco 7576" section on page 7-14. (For all Cisco 7500 series routers, a spare CI ships as Product Number MAS-7500CI=.)

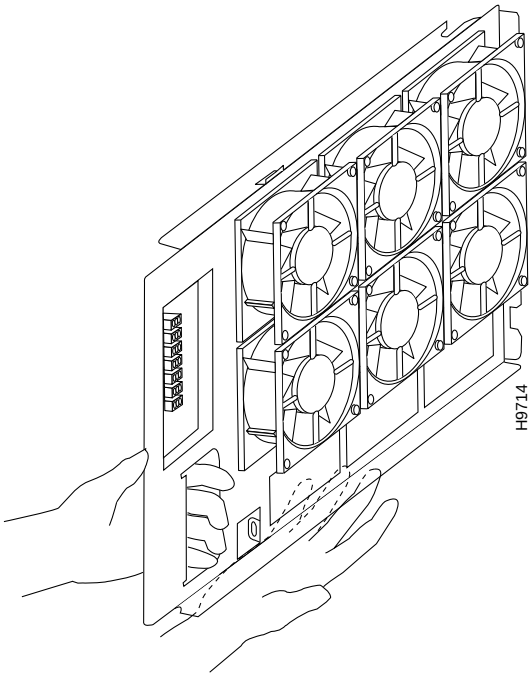
Fan Tray and Blower Assembly Overview

Blower and fan tray assemblies cool the interior of the Cisco 7505 router chassis. It may be difficult to determine whether or not the fans or blowers are operating in noisy, air-conditioned rooms. If you determine that they are not operating, contact a customer service representative immediately. There are no installation adjustments that you should make if the fan or blower assembly does not function properly at initial startup.

Cisco 7505 Fan Tray Assembly

The Cisco 7505 uses a fan tray assembly (see Figure 1-31) consisting of six fans that supply cooling air to the chassis interior. The assembly is accessible from behind the chassis front panel.

Figure 1-31 Fan Tray Assembly (Cisco 7505)

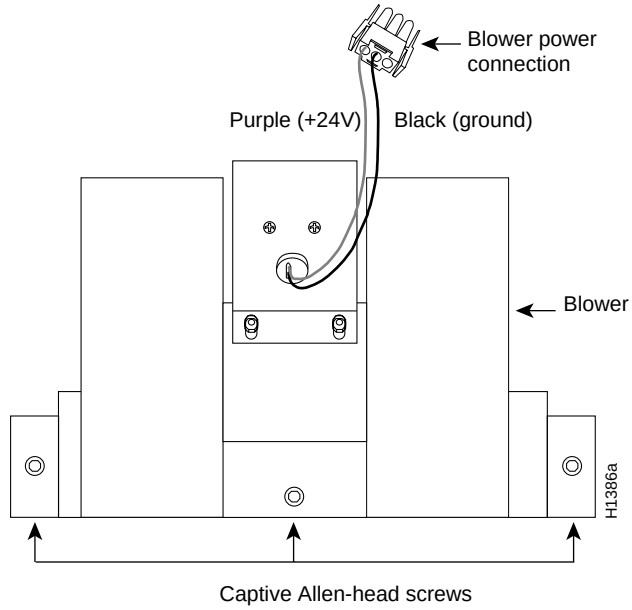


All six fans should be operating whenever system power is on. The system automatically shuts down if any one or more of the fans is operating outside the specified range. A variable speed feature allows the fans to operate at a slower speed when the internal chassis temperature is within the normal operating range, and at a higher speed if the internal temperature exceeds a specified temperature. (A spare fan tray ships as Product Number MAS/5-FAN=.) For fan tray maintenance information, see the "Removing and Replacing the Cisco 7505 Fan Tray" section on page 5-5.

Cisco 7507 and Cisco 7507-MX Blower Assembly

The Cisco 7507 and Cisco 7507-MX uses a blower assembly (see Figure 1-32) that supplies cooling air to the chassis interior. (A spare blower assembly ships as Product Number MAS-7KFAN=.) For blower assembly maintenance information, see the "Removing and Replacing the Cisco 7507 and Cisco 7507-MX Blower Assembly" section on page 6-15.

Figure 1-32 Blower Assembly (Cisco 7507 and Cisco 7507-MX)



Cisco 7513, Cisco 7513-MX, and Cisco 7576 Blower Module Assembly

The Cisco 7513, Cisco 7513-MX, and Cisco 7576 use a blower module assembly that is located at the top rear-end of the chassis (see Figure 1-33 and Figure 1-34). The assembly supplies cooling air to the chassis interior. The blower module assembly also contains the system LEDs, which are located on a nonremovable printed circuit card at the rear of the interior of the blower module assembly. (A spare blower module assembly ships as Product Numbers MAS-7513-FAN= for the Cisco 7513 and Cisco 7513-MX and MAS-7576-FAN= for the Cisco 7576.) For blower module assembly maintenance information, see the "Removing and Replacing the Cisco 7513, Cisco 7513-MX, and Cisco 7576 Blower Module" section on page 7-10.

Figure 1-33 Blower Module Assembly (Partial Rear View of Cisco 7513, Cisco 7513-MX, and Cisco 7576)

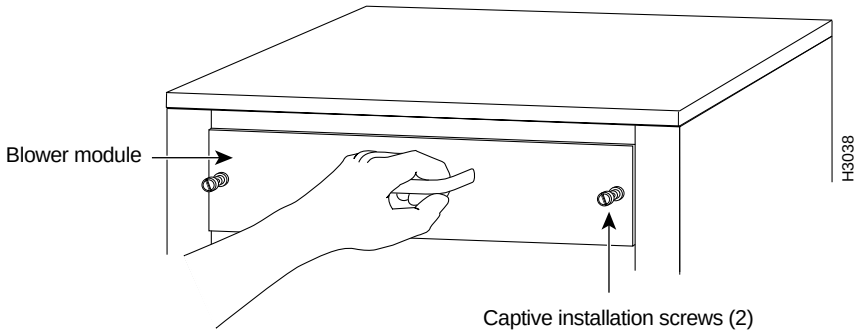
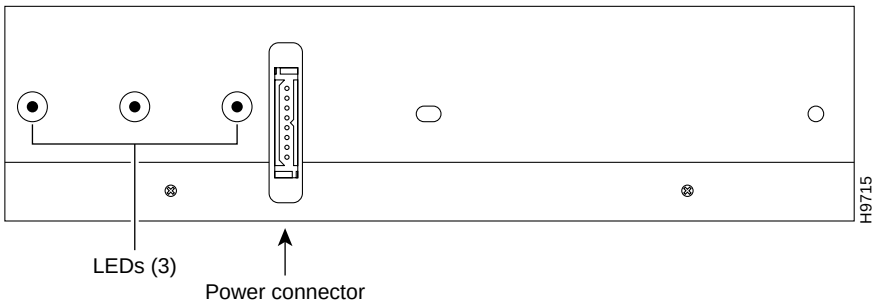


Figure 1-34 Blower Module Assembly (Rear View)



Interface Processor Overview

Interface processors for the Cisco 7500 series routers are separate processor modules that are installed in the routers' interface processor slots and attach to the system backplane.

Note For complete information on each of the interface processors available for the Cisco 7500 series routers, refer to the companion publication *Interface Processor Installation and Configuration Guide*, and to the individual configuration notes that ship with each of the interface processors.

Each interface processor comprises a modular, self-contained interface (printed circuit) board and one or more network interface connectors in a single 11 x 14-inch unit. You can install and remove interface processors without opening the chassis (known as online insertion and removal, or OIR) and without turning off the chassis power.

The microcode on each interface processor contains board-specific software instructions. New features and enhancements to the system or interfaces are often implemented in microcode upgrades.

Each interface processor (and the Cisco 7500 series router in which it is installed) supports downloadable microcode, which enables you to download new microcode images remotely and store them in Flash memory. You can then use software commands to load a specific microcode image from Flash memory.

Each interface processor has a unique bank of status LEDs, and all have a common LED (called the *enabled* LED) on the interface processor's faceplate. The enabled LED lights when the interface processor has completed its initialization, indicating that as a minimum, the interface processor is correctly connected to the backplane, that it is receiving power, and that it contains a valid microcode version. If any of these conditions is not met, or if the initialization fails for other reasons, the enabled LED does not light. Additional LEDs on each interface processor type indicate the state of the interfaces.

The following interface processors are available for the Cisco 7500 series routers:

- AIP—Asynchronous Transfer Mode (ATM) Interface Processor, with one TAXI 4B/5B, SONET/SDH (STS-3 or STM-1), E3, or DS3 interface
- CIP2—Channel Interface Processor, with any combination of one or two bus and tag and/or one or two Enterprise System Connection (ESCON) interfaces
- CT3IP—Channelized T3 Interface Processor, with T1 (DS1) and T3 (DS3) interfaces
- EIP—Ethernet Interface Processor, with two, four, or six AUI interfaces
- FEIP and FEIP2—Fast Ethernet Interface Processors, with up to two 100BaseTX or 100BaseFX or Media Independent Interface (MII) interfaces

- FIP—Fiber Distributed Data Interface (FDDI) Processor, with one single attachment or dual attachment single-mode and multimode FDDI
- FSIP—Fast Serial Interface Processor, with four or eight synchronous serial interfaces (EIA/TIA-232, EIA-TIA-449, EIA-530, X.21, V.35, or E1-G.703)
- GEIP—Gigabit Ethernet Interface Processor (GEIP), a single-port, fixed-configuration interface processor that, when combined with the appropriate optical fiber cable, provides one 1000-Mbps IEEE 802.3z-compliant Gigabit Ethernet (GE) interface.
- HIP—High-Speed Serial Interface (HSSI) Processor, with a single HSSI
- MIP—MultiChannel Interface Processor, with up to two channelized T1 interfaces
- POSIP—Packet OC-3 Interface Processor, with one SONET/SDH (STS-3c) single-mode or multimode interface
- TRIP—Token Ring Interface Processor, with two or four high-speed (4- and 16-Mbps) Token Ring interfaces
- VIP2 & VIP4—Second-Generation and Fourth-Generation Versatile Interface Processor, with many combinations of the following interfaces and services (available by way of up to two interchangeable port adapters and service adapters on each VIP2 or VIP4):
  - Synchronous serial (port adapter)
  - Token Ring (port adapter)
  - Ethernet 10BaseFL (port adapter)
  - Ethernet 10BaseT (port adapter)
  - Fast Ethernet 100BaseTX and 100BaseFX (port adapter)
  - FDDI (half-duplex and full-duplex port adapters)
  - HSSI (port adapter)
  - Basic Rate Interface (BRI) port adapter
  - Primary Rate Interface (PRI) port adapter
  - ATM (port adapter)
  - E1-G.703/G.704 (port adapter)
  - E1 (port adapter)
  - E3 (port adapter)
  - T1 (port adapter)
  - T3 (port adapter)
  - 100VG AnyLAN (port adapter)
  - Compression (service adapter)
  - Encryption (service adapter)

Note Port and service adapters are not limited to the types indicated in the preceding list.

System Software Overview

In Cisco 7500 series routers, Flash memory on the RSP contains the default system software. An EPROM device on each interface processor contains the latest interface processor microcode version, in compressed form. At system startup, an internal system utility scans for compatibility problems between the installed interface processor types and the bundled microcode images, then decompresses the images into running memory (DRAM). The bundled microcode images then function the same as images loaded from the microcode EPROM.

The Cisco 7500 series routers support downloadable Cisco IOS software and interface processor microcode images, which enables you to remotely download, store, and boot from a new image. The Cisco IOS image runs from the DRAM on the RSP; interface processor microcode images run from the DRAM on the specific interface processor.

The publication *Upgrading Software and Microcode in the Cisco 7000 Series Routers* which is available online, on the Documentation CD-ROM, or as a printed copy, provides instructions for upgrading from a TFTP server, floppy disk, or Flash memory card.